AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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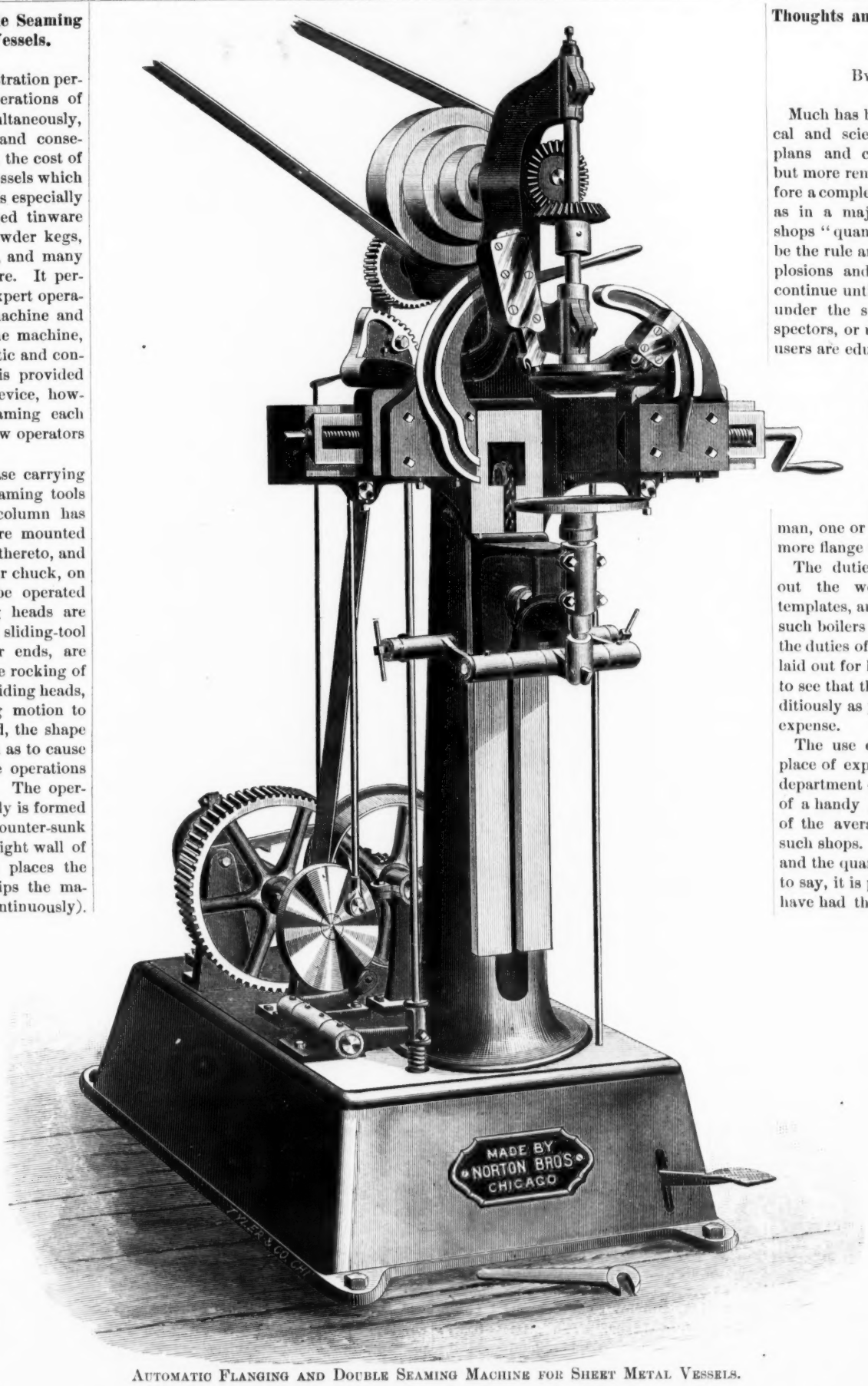
For Sale Everywhere by Newsdealers.

ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

Automatic Flanging and Double Seaming Machine for Sheet-Metal Vessels.

The machine shown in our illustration performs automatically the two operations of flanging and double seaming simultaneously, in one continuous movement, and consequently effects a great saving in the cost of manufacture of all sheet-metal vessels which require to be double seamed. It is especially adapted for use in making pieced tinware (straight or flaring), tin cans, powder kegs, paint, lard, and butter packages, and many other articles in sheet-metal ware. It performs its work as rapidly as an expert operator can place the article in the machine and take it out, without touching the machine, being, in fact, absolutely automatic and continuous in every movement. It is provided with an intermittent locking device, however, so that it stops after seaming each vessel, if required, in teaching new operators or in very large work.

The machine consists in a base carrying the mechanism for driving the seaming tools and the clamping chucks. A column has arms on either side on which are mounted sliding heads adjustably secured thereto, and a front bracket carries the lower chuck, on which the vessel is placed to be operated upon. Mounted on the sliding heads are upright grooved cams, in which sliding-tool holders, having rollers in their ends, are mounted in such manner that the rocking of two shafts, also mounted on the sliding heads, impart radial and reciprocating motion to the slides as the shafts are rocked, the shape of the cam grooves being such as to cause the seaming tools to perform the operations of flanging and double seaming. The operation is as follows: The can body is formed and soldered as usual, and a counter-sunk end applied fitting inside the upright wall of the vessel. The operator then places the vessel on the lower chuck and trips the machine (if it is not running continuously). Instantly the vessel rises until it is clamped between the upper and lower chucks of the machine, rotary motion being given to the vessel from the upright shaft on which the upper chuck is mounted. At the same instant the vessel is being clamped, the seaming tools rise up out of the way, and after the vessel is rigidly clamped and held between the chucks, which have a rapid rotary motion, the seaming tools descend (guided by the upright cam) into the proper position to perform the work as described before. As the seaming tools finish their work they withdraw from the vessel, and while they are traversing the cams on the return or upward stroke, the lower chuck descends and the vessel is removed and another one placed in the machine. Thus it will be seen that no particular mechanical skill is involved, and the strength, simplicity, and apparent durability of the several parts are remarkable. A countershaft having cone pulleys accompanies each machine; weight, complete, about 1,200 pounds.



AUTOMATIC FLANGING AND DOUBLE SEAMING MACHINE FOR SHEET METAL VESSELS.

This machine will, without doubt, soon be found in all our well-equipped manufactories of sheet metal ware. It is manufactured by Norton Brothers, of Chicago, Ill.

An enterprising dealer has commenced suit against parties for infringing his patent on the use of the word "misfit," as applied to certain goods. Why can't some equally enterprising dealer in second-hand boilers claim a monopoly of the words "second-hand?" There are apparently a good many who will pay more for a boiler that has been proved by a few years' use, and the words "second-hand" might be made as valuable as the word "misfit."

Thoughts and Hints on Boiler Construction.

BY GEORGE MARSHALL.

Much has been said and written by practical and scientific engineers regarding the plans and construction of steam boilers, but more remains to be said and written before a complete reform can or will be effected, as in a majority of the present-day boiler shops "quantity, not quality," continues to be the rule and practice. This being so, explosions and accidents must of necessity continue until boiler construction is placed under the supervision of Government inspectors, or until boiler makers and steam users are educated to the necessity of using only such material as may be required from the nature of their work, and allow only first-class intelligent labor to be employed in boiler construction. In many of the contract shops the skilled, educated labor employed consists of the shop foreman, one or more leading men, and one or more flange turners.

The duties of the foreman are to lay out the work, or make the necessary templates, and supervise the construction of such boilers as he may have orders to build; the duties of the flanger to turn all flanges laid out for him, and the duties of the fitter to see that the work is put together as expeditiously as possible, and at the least possible expense.

The use of a riveting machine takes the place of experienced riveters, and places the department of riveting usually in the hands of a handy helper, his assistants consisting of the average labor usually employed in such shops. Where snap-riveting is done, and the quantity rule is practiced, as, I grieve to say, it is practiced in all such shops as I have had the privilege of inspecting, there is but very little attention given to the amount of damage that may and can be done by excessive drifting, and other practices of a similar nature, which too often receive no attention from the foreman or superintendent. In many shops the actions of a foreman in regard to construction are regulated by office instruction, and it frequently occurs in such cases that in time the foreman's knowledge seems to be limited to a simple observance of the rules laid down for his guidance; his opinions, practice or theories receiving no attention, and he himself (no matter how high his standard of ability), being merely looked upon as the enforcer of ideas which are erroneous in principle and even more erroneous and dangerous in practice.

The talent employed in making plans of boilers sometimes consists of a young man whose proper place is at the desk or table of an experienced engineer and draftsman, but who, on account of influence or economy, is entrusted with important matters far beyond his ability to master. As a result of such

practice boilers are not constructed with due regard to equalized strain in actual use, the tendency to disruption and distortion not being generally understood. The bracing in such cases is done in the poorest manner possible. Even where the foreman is supposed to be absolute in matters of this kind, it frequently occurs that in time he becomes careless from the constant pressure employed in his efforts to make his work profitable, where the same has been contracted for at low figures, and only by employing the cheapest labor and overlooking serious defects can his shop or his personal efforts show the expected margin of profit. I have lately had the privilege of making a close inspection of such a shop, and it is a wonder to me, after seeing what I did, why there are so few boiler explosions in the country, and why there is not State and Governmental interference in boiler construction. I have no desire to unjustly criticise the methods employed by any one in his business, but when the outcome of such business has risks of such magnitude involved in practice as there is in the steam boiler, interference of some kind from some quarter is not only desirable but necessary.

The caulking of a boiler is one of the most important of the boilermaker's duties, and I have seen more damage from caulking tools than I have ever seen done with the much quoted "drift." Where poor material is used and unskilled caulkers employed, the damage done to a boiler can only be computed by the strength and ignorance employed in this branch. That great damage is done, I can personally and truthfully certify, and yet there is but very little attention bestowed on this most important part of construction.

Braces are placed where they are more of an injury than a benefit, as there is such a thing in boiler practice as having too rigid points, and where these occur to any extent excessive and unnecessary strain is thrown upon some other, and perhaps weaker part of the work. I have lately seen braces placed in a horizontal tubular boiler on a line with and distant from tubes four and a-half inches. As the tubes of necessity must expand more than the shell of boiler, they being so much lighter and susceptible to the influence of the heat, the braces referred to prevented the working of the head in harmony with expansion, or else threw the entire strain of expansion on the rolling of the tube in the plate. Had attention been given to this matter, and had it been known that each tube acted as a brace in supporting the flat end, the braces would have been placed in proportion to the contemplated pressure and duty of such a boiler, thus leaving a point of expansion between the tubes and braces which would, in a measure, conform to the expansion of the tubes.

The custom is in some shops where horizontal tubular boilers are built, to place the longitudinal seams below the brackets, consequently exposing them to the effects of direct heat. It is also customary in such shops to carry the caulking edge of outside sheet downward to facilitate the caulking in case the seam should leak, thus exposing the caulked edge of plate to fire cracks and other defects which in time become manifest. This custom is the result of ignorance or lack of thought on the part of the builder, and is in time a positive injury and expense to the owner, as the necessity for repairs at an early date are thus greatly increased, and where such repairs are required the side walls must be torn down in order to get at the affected part.

It is also customary by many boiler makers to bring the longitudinal seams on one side and close together. This should also be condemned, as it is well known—or should be well known—that the seams are the weakest parts of the boiler, and when the seams are placed as stated, the factors of weakness in all of the courses are concentrated at one point. The seams in the front and back courses should be placed in line with each other, but above the cast lug or bracket, and the seam of the center or dome course should also be placed above the fire line, but not within the diameter of dome flange.

Two brackets on each side, when made of sufficient strength and properly located, are, in my opinion, better than three, as the walls are commonly injured from the firing and defective construction, and where the back lug works on rollers the possibility of successful expansion is provided for far better by one plate than would be done by more, which would be thrown out by the injury to the side walls.

Where the seams are placed as thus noted, on opposite sides of the shell, the better plan is to turn the caulking edge upward, as by this means, should leaks occur, they can be readily detected and repaired without any injury done to the brick work; in fact, it should be the study of boiler builders to provide for the repairs of the boiler almost as much as the proper construction of it.

The custom of riveting T-iron to heads, and from these running braces to shell, does not meet with my approval, for the simple reason, well known to all boilermakers, that the strength of T-iron does not bear any comparison with the strength of first-class bar iron; and, as it is customary to punch the brace holes in web of T-iron, the initial fracture is thus imperceptibly given before the strain of pressure is brought to bear on the web.

It should also be remembered that T and T-iron is rolled with the grain running the length of the bar, and, as the pieces used for brace purposes are generally short, the result is a split from one end to the other; this, at least, has been my experience and observation, and for these reasons I prefer the crow-foot brace. The gusset brace, which is sometimes used, is objectionable in some respects, the most important being the rigidity of the same when properly constructed. When improperly made, it is, of course, undesirable.

Ordinarily, cylindrical courses of boiler shells should be made in one piece, and with only one seam. Some builders prefer two seams in each course, with a better quality of iron exposed to the action of the flame. When two such seams are used, the strength of boiler should be calculated in accordance therewith. The planer and beveling machine are substituted for the chipping or beveling of plate edges, but the duties of the caulker still remain, and thus far no substitute has been invented for doing this class of labor. If caulking depreciates in the next decade as it has in the past, something must be devised to take the place of skilled workmen, who are gradually being driven from this branch by the careless and criminal methods employed by many builders, in intrusting this really important part of boiler-making to the hands of ignorant and unskilled men.

The folly of allowing the shell of boiler within the dome flange to be weakened by cutting, without reinforcing the weakened part, has been proven repeatedly, yet the custom still prevails in many shops of removing sufficient of the shell to admit a man's body into the interior of dome, with no thought of strengthening the weakened part, and this will prevail until prevented by legislative interference. It may be that in time the use of a dome will be entirely dispensed with, and believed by all, as it now is by many, an injury to the boiler; but until its use is abolished means should be taken to strengthen the shell within the dome flanges.

It is no wonder that ignorance prevails in boiler shops and boiler practice. The less a man knows on some subjects, and the more subservient to his employer's wishes, the more he is appreciated—at least, it seems to me such is the rule at present.

A mixture of small corks and cement is employed in Germany for covering boilers to prevent radiation of heat.

Not many months ago every American watch factory was running full capacity with abundant orders ahead. Now it is all changed. The Waltham, Mass., factory, which is the largest of all, has shut down until August 15, and the Springfield, Ill., factory until September 1. Trade is dull as long credits have to be given. The heaviest demand has been for the cheaper grade of watches.

Fig. 1

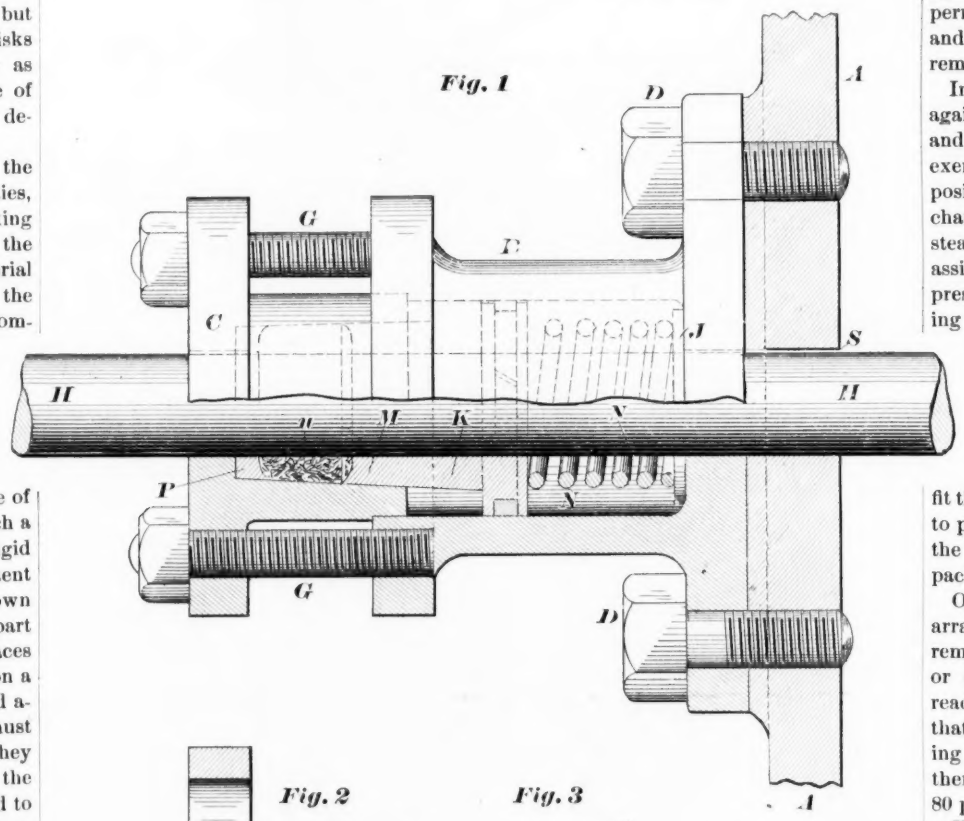


Fig. 2

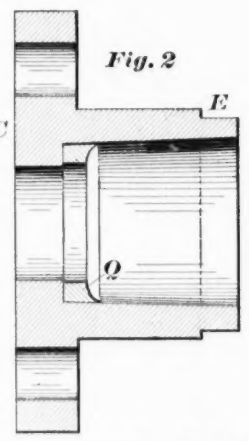
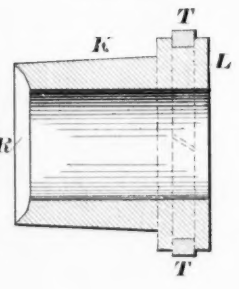


Fig. 3



THE FARMER-CALDER ROD PACKING.

The Farmer-Calder Rod Packing.

The engravings shown with this represent a new arrangement for packing piston rods and valve stems, and for other similar purposes, manufactured by the Farmer-Calder Rod Packing Company, 40 Kilby St., Boston, Mass. It is designed for application to all classes of engines already constructed, no alterations being required except such as can be made while the engine is running, the application requiring but a few minutes of time. The new parts required are the gland *C*, sleeve *K*, ring *P*, and spring *N*. The packing, *u*, which may be of any kind of fibrous material ordinarily used for the purpose, is held in the chamber of the gland between the sleeve and ring, which are concaved for the purpose, as shown at *Q* and *R*, Figs. 2 and 3.

The gland is made with a shoulder, as at *E*, Fig. 2, which makes a steam-tight joint against the stuffing-box, being screwed up permanently when the packing is applied, and requiring no further attention until it is removed for inserting new packing.

In operation, one end of the spring *N* rests against the bottom of the old stuffing-box, and the other against the sleeve *K*, thereby exerting a pressure to keep the packing in position when there is no pressure in the chamber behind the sleeve. When working steam, the steam pressure in this chamber assists in forcing the sleeve forward, compressing the packing around the rod, following up any wear that may occur until the packing is so nearly gone as to require renewal. When this is the case, by removing the nuts or bolts *G* and slipping the gland forward, new packing can be readily introduced.

The sleeve *K* and ring *P* are bored to fit the rod, but are fitted in the chambers so as to permit lateral vibration of the rod without the usual rapid destruction of the parts and packing.

One of the advantages claimed for this arrangement is that the packing is so far removed from the heat as not to be burned or destroyed by it; another, that it more readily accommodates itself to the rod, and that it remains tight until worn out, requiring no attention from the engineer, and that there is much less friction, and a saving of 80 per cent. of the packing ordinarily used.

We are informed that it has already been applied to several locomotive engines with entirely satisfactory results.

Mechanical Engineering Department of the State University of Illinois.

The State University of Illinois is situated between the adjoining towns of Champaign and Urbana, near the crossing of the Illinois Central and I. B. & W. R. R. Among its various colleges is that of engineering, including the schools of architecture, mining, civil and mechanical engineering. The object of the department of mechanical engineering is to prepare young men for that profession. It aims to fit them to invent, design, construct and manage machinery; to bring together in the same person the practical and the theoretical; and the instruction, while severely scientific, is thoroughly practical. The course of study, which has been carefully selected, requires four years for its completion. Mathematics (the Greek and Latin of the engineer) begin with trigonometry, and cover all branches included in a strictly first-class engineering course.

The facilities and instruction in drafting leave nothing to be desired. From projection drawing, where the use of the instruments, geometrical construction, etc., are taught, the student is taken through descriptive geometry, lettering, shading, tinting, and finally must turn out complete sets of working drawings, such as are used in the best-regulated machine shops in the country. The other studies of the course include French, German, mechanism, chemistry, analytical mechanics, physics, materials of engineering, prime movers, with Rankine's Steam Engine as a text-book, resistance of materials, mill work, etc.

In connection with this department is the large machine shop—a model of cleanliness,

order and good management—a fit place for the young mechanic to form habits which will stick to him through life. Besides the well-equipped pattern and blacksmith shops, the shop contains the following first-class machine tools, driven by a 25 horse-power engine:

One planer (Putnam Machine Company), 18″x20″; 6 ft. bed.

One 15″ shaper (Hendey Machine Company.)

One combined gear cutter and milling machine.

One screw-cutting engine lathe (A. M. Powell & Co.), 16″ swing, 5 ft. bed.

One screw-cutting engine lathe (Ames Manufacturing Company), 13″ swing, 5 ft. bed.

One screw-cutting engine lathe (Blaisdell), 16″ swing, 5 ft. bed.

One screw-cutting engine lathe (Wright & Smith), 14″ swing, 6 ft. bed.

One screw-cutting engine lathe (Putnam Machine Company), 20″ swing, 12 ft. bed.

Four hand-turning lathes, 6 ft. bed.

One wood-turning lathe, 24″ swing, 10 ft. bed.

One centering machine; one large and one small upright drill (large one built and designed at university shop), 7 ft. 6″ high × 24″ table; metal shears and punch; a full equipment of bench tools, etc.

Shop practice forms an important part of the course, and is counted as a study. It is here the student is made familiar with all the ordinary cutting tools, and with the form and condition of the same for most effective work. The course of practice represents four different shops, viz.:

(1) Pattern making.
(2) Blacksmithing.
(3) Bench work in metal.
(4) Machine tool work in metal.

In the first, the practice consists of planing, turning, chiseling, etc., in wood; in producing true surfaces of various shapes, and also in combining pieces of wood by glue joint, preliminary to correct pattern making. Patterns are finally made, from which pieces are cast in iron, brass, etc., to be worked in the subsequent shops. In the second, the student uses the forge, and performs first the various elementary operations of drawing, upsetting, bending, welding, etc., and further along tool forging, hardening, and tempering.

In the third, a course of free-hand bench work is given, the cold chisel, file, hammer, and vise being the only tools used. After the hand and eye are sufficiently trained, fitting is begun, and the square, level, scale, and other bench tools are allowed; pieces are carefully fitted together with the file, and surfaces finished. In the fourth shop the ordinary machine tools are used—turning, boring, planing, drilling, polishing, and hand-turning, the elementary forms being first taken up. Following this is a course of fitting and finishing, in which the calipers, scales, etc., are used. This course of elementary shop practice fits the student for the advanced work of designing and constructing complete machines, uudertaken later on. In this he is under the immediate direction of competent draughtsmen and instructors, and carefully determines the dimensions, shapes, etc., of some machine, produces them in neat, accurate working drawings, and makes tracings of the same for his use in the shop, where he constructs the machine selected. The department is provided with a fine collection of models, forming illustrations in the study of mechanism. Experiments in the testing of prime movers, resistance of materials, etc., are undertaken by each student. Indicator diagrams are taken and carefully studied.

Throughout the course, quality and not quantity is sought both in work and number of students. Under the present management the school is gradually increasing in reputation, as, indeed, it should. We need more schools of the same character; for the engineer, to be successful, should go forth as well prepared to meet competition as the lawyer or the doctor. Being a State institution, the expenses are such as may be met by all in ordinary circumstances. S. W. S.

Birkenhead's Rotary Tool Post.

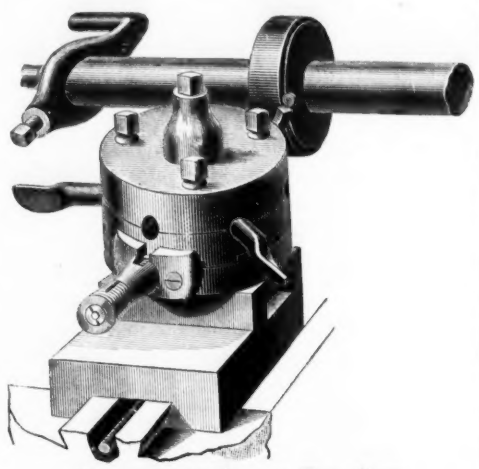
This tool post is a rotary or turret head applied to the carriage block, and is especially designed for use where more than one tool is required to be used on work before removing it from the centers or chuck. The head is secured to the tool-post block by means of a square-headed bolt. This bolt is covered by a sleeve nut, by turning which the lower disk, which does not revolve, is made fast.

The tools are made with round shanks, to fit the holes in turret, and are clamped by means of three bolts which draw the two disks together.

There are six holes for tools, but when only three of them are used the projection of the tool takes up no extra room, longitudinally, since when one tool is in use the other two will stand in a direction towards the operator.

The tool in use, when the position of the turret head is governed by the stop, is held at right angles with the work, but should it be desirable to change the angle the stop can be withdrawn and the sleeve nut used to hold the tool in the position desired. The stop is wedge-shaped to compensate for wear, and when drawn out can, if required, be held in that position by simply turning the slot in the thimble by the pin.

When used for chucking it has the advantage of the feed rod for operating, or the tail stock spindle can be applied against the tool post.

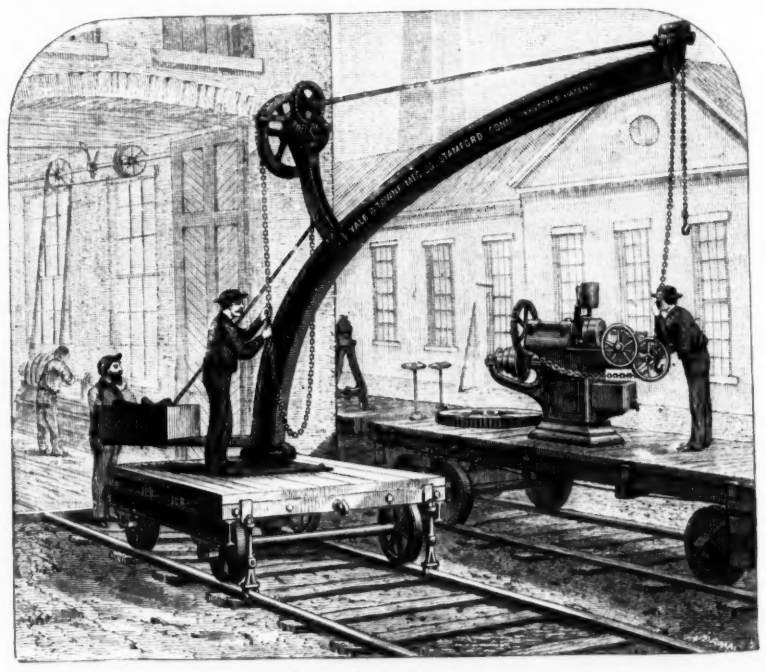


BIRKENHEAD'S ROTARY TOOL POST.

This tool post can be readily applied to an ordinary lathe, and is highly recommended for brass work, and the duplication of parts and pieces. It is made by John Birkenhead, Mansfield, Mass.

Hand Truck Crane.

There are many cases in which some machine for handling loads and moving them about in the yards or shops is exceedingly desirable. Except in limited area fixed cranes are not useful, and even traveling cranes are only useful within the limits covered by the tracks. We illustrate herewith a crane which can be used in any yard or shop that is provided with ordinary track, and which can readily be moved from place to place. This is a hand-power crane placed upon a truck, and revolving in a base plate. The truck is of the usual construction, and, when necessary, may be held to the track by clips. The counterweight fixed at the base of the boom renders clips unnecessary in most cases. The hoisting is done from the truck, and, as is the case with all cranes made by the Yale & Towne Manufacturing Company, the hoisting mechanism is provided with an automatic sustaining device, which holds the load at any point. The load being hoisted, the boom is swung around and the load traversed to any point desired. This crane is on the same principle as the locomotive cranes so much used in England, except that it is designed to be worked by hand, and consequently only for moderate loads. It is made by the Yale & Towne Manufacturing Company, Stamford, Conn.



HAND TRUCK CRANE.

We clip the following from the June issue of the *Locomotive*, published by the Hartford Boiler Insurance Company:

"No one needs to be told that a deficiency of water is a dangerous thing in a boiler, and it seems strange that any one should spend time, money, and brains to invent an apparatus to bring such a state of affairs about, but such it seems is the case, in proof of which read the following item, which we have clipped from a contemporary:

"'New Safety (?) Device for Steam Boilers. An English engineer proposes an additional safety-valve on the lower part of the boiler, to be constructed in such a manner that an excess of pressure will open it and allow the boiling water to escape. A boiler constructed on this principle was tested in Birmingham, England. It was heated to redness, and cold water pumped into it, which produced in half a minute a pressure of 50 to 60 pounds with less than $5\frac{3}{8}$ quarts of water. Although all the safety valves are equally secured, the one at the lower part of the boiler came first into action, and *the result was entirely satisfactory.*'

"The italics are ours. We have no doubt that the result was satisfactory, eminently so. Although the item does not state expressly that the inventor was killed, we take it for granted that he was, for 'the result was entirely satisfactory.'

"The above is a fair sample of about half of the notions that are patented for the purpose of promoting safety in the use of steam-boilers. How such things originate is a mystery to us. And that a man who is idiot enough to devise such a piece of foolishness should be dignified with the title of engineer is a libel upon the respectable members of the profession. It is about on a level with the American engineer, who, a short time ago, proposed to test boilers by hydrostatic pressure, and combine the advantages of the cold and hot water tests in the following manner: He first proposed to get up steam to the desired working pressure, then open the safety-valve and blow off the steam, *leaving the water in the boiler at the temperature due to the pressure of the steam before it was so blown off.* Then pump in cold water until the required test pressure was attained. Thus he got the combined advantages of the test by cold water and the high temperature due to the steam pressure (in *his* mind). This was a most wonderful 'straddle,' and would doubtless have delighted the simple heart of Ah Sin.

"And yet the above was proposed by an engineer whose name is well known, who is a graduate of one of our best technological schools, and is at present editor of an engineering journal which aspires to lead the country in engineering matters and methods."

The Cobden Club—we mean the parent club in England, and not any of its American offshoots—has just sat down to another dinner, which is described as "a memorable affair, particularly in the matter of *menu;* the dinner cost $20 per plate." The peculiar sort of philanthropy which the club teaches to the benighted people of the United States and to the barbarous people of other countries outside of the British Isles, must be yielding good returns to these Cobden Club members.

In the proceedings which took place after the $20 dinner had been served we read that, "in introducing the principal guest of the evening, Dr. Smith, of Sioux City, Iowa, Lord Carlingford described him as one of the recent illustrious American converts to the philosophy of Cobden, which had done so much for the commercial glory of England, and which, when adopted by the Americans, would remove the last bar to their commercial supremacy." And we also read that "Dr. Smith, in his reply, devoted much of his address to a description of the work being done in the United States by the revenue reformers, and to the story of the progress of that work in changing and enlightening American public opinion."

We would not wish to seem to be unduly curious about the affairs of our "kin beyond sea," and yet we *would* like to know, you know, what it has cost the Cobden Club to secure the attendance at its dinner of this "Dr. Smith, of Sioux City, Iowa," what it cost the club to make him one of its "converts," and what it is costing the club to carry on the work which Dr. Smith says is "being done in the United States by the revenue reformers" with such flattering success. The Cobden Club is just too provoking for anything in its habitual reticence about the details of its philanthropic work in this country. It gives us a little information, just enough to excite a longing desire for more, and then it shuts itself up like an oyster. At $20 per plate we know that its philanthropy must pay Englishmen handsomely, but what it costs we are never told, and can only guess.—*Bulletin of the American Iron and Steel Association.*

In the Southern States opportunities will be afforded for some years for starting manufacturing enterprises in a small way. There will be room for the small foundry and machine shop, starting in on a local basis, ready to do almost anything with limited facilities, and with a reasonable prospect of developing into rivals, in magnitude of operations, of the largest Eastern establishments. Local pride is favorable to the establishment of enterprises that are to be permanent, and much material used is and will be cheap in the South. Good judgment is necessary in selecting locations, and mechanical ability is quite as essential to success there as elsewhere. Those who start such enterprises in the South with little capital and immediate "great expectations," are likely to be disappointed. But for those who are willing to grow up with the other industries there are undoubted openings in many of the Southern States.

Momentum and Rules for Weighting Copes.

BY THOMAS D. WEST.

FIRST PAPER.

In an article on weighting down copes, AMERICAN MACHINIST, July 22, 1882, I said it was absurd to my view for one to say he could figure the *exact* weight required. I well knew this assertion would receive criticism. The criticisms came, and I think my answer published March 10, 1883, fully proved that there is a *momentum*, and that it is absurd for one to say he can figure the *exact* weight that is *just* sufficient to hold down all copes. To say the statical head is all the pressure copes are subjected to, is to maintain that there is no momentum, and no difference in moulds or forms of gates.

As I have proved that momentum enters into the question in pouring moulds, I am now ready to present rules which in connection with the article of March 10, 1883, will, I think, provide a simple and intelligent solution of weighting copes by mathematical calculation. Were there no conditions to be considered, and were all moulds filled without any sudden pressure upon the copes, then it might be true, as one of my critics said (AMERICAN MACHINIST, Aug. 19, 1882): "The science of hydraulics demonstrated by experience, proves that: Given height and surface, and application of multiplication, the result will be, not an approximation, but certainty itself."

. In figuring the head pressure for water, etc., experience has no doubt demonstrated there is a certainty or exactness to be obtained by mathematical calculations. When one comes to apply the science of hydraulics, or properly, hydrostatics, to foundry practice, my experience would make it read, not a certainty, but an approximation. While there are rules to be given for figuring up the pressures upon copes, they are, at their best, when practically applied, but an approximation, and in many cases much more weight than the actual statical head figures up will be required. The momentary pressure almost all copes receive is caused by the sudden attaining of a head, or commonly speaking, the filling up of the gates when the mould is full. Did the gates or risers (when a mould was full) fill up as gradually as the mould, then there would be no momentum. As a general thing, it takes from five up to over one hundred seconds to fill the common run of moulds with metal, whereas the gates through which they are poured will generally fill up in about one second. The higher the top of pouring gates above the mould's lifting surface, the greater the increased lifting force of momentum.

In the article of March 10, 1883, is fully shown how some forms of pouring gates will require different amounts of weight in pouring moulds having exactly the same lifting area, and same height of heads or gates. As supplementary to those two examples, the engravings, Figs. 1, 2, 3, 4, 5 and 6 are given, in which is further illustrated how figuring for cope weights is but an approximation, and that for practical safe working one cannot figure the *exact* weight required.

The forms of gates here shown are those commonly used. In Fig. 2 we have the pouring gate higher than the riser. The result is that neither the height of the pouring basin nor the riser can be figured from to obtain a weight which would be the nearest to the copes lifting capacity. The mould in Fig. 2 is supposed to have 144 square inches of lifting surface, and as shown, has a basin or pouring head 12″ above the lifting or cope's surface. This mould, were the cope's lifting pressure theoretically figured for the 12″ head, requires a weight, including cope, of 450 pounds. With the style of pouring basin and gate shown, and having a riser 6″ lower than the pouring basin, however quickly, at the last, the gates or heads were "brought up," the 450 pounds could not be raised. On the other hand, were one to figure for

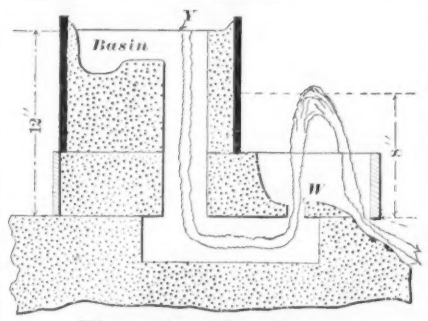
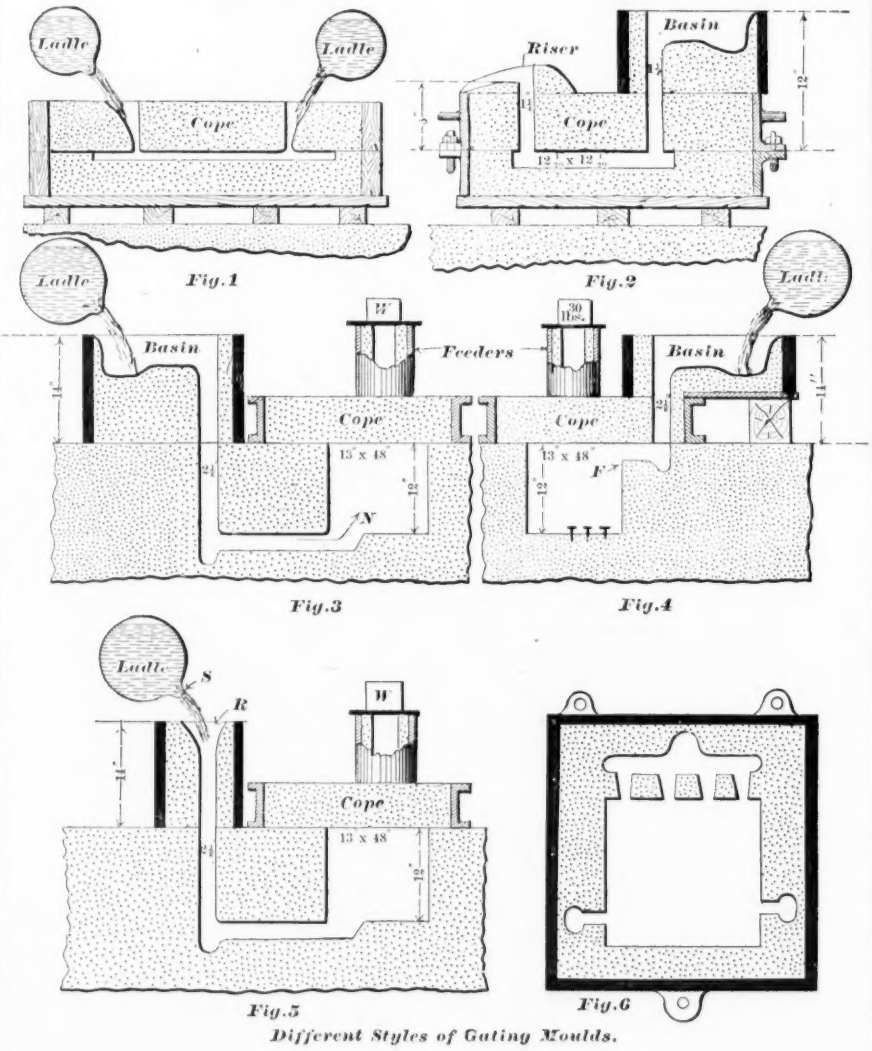


Illustration of Head Weight in Restricting a Flow

the weight, taking the height of the riser for the lifting head, he would require half of 450 pounds, as the riser's height is 6″, or half of 12″; therefore to weight for a 6″ head we would, theoretically figured, require a weight of 225 pounds. With such a weight, even being "brought up slow," the cope would lift. The mean of these two



Different Styles of Gating Moulds.

weights—337½ pounds—is about as near as one could theoretically figure for a safe weight. By pouring so as to bring up the pressure slowly a weight of 250 pounds would hold the lift of the 6″ head. In all these experiments, after the basins and riser were formed, the copes were weighed and weights added until the copes and all weighed as per figures given.

When one has a plain surface, it is simple enough to figure the head pressure, but when one comes to apply hydrostatics to every thing that comes along it is different. It may in some jobs be safe enough to take the mean of riser and pouring basin as the lifting head, or height to figure from. Unless there is over six inches difference between the height of riser and pouring heads, I would not advise, in any of the styles of gates shown, to figure the pressure from the mean of the head's heights. He that will make it a practice to always take the highest point of the pouring basin as the lifting head, and then allow extra weight, in proportion as the style of mould and gates are productive of momentum, will work the most secure. Were it always practicable to have enough area of riser, to carry off the metal as fast as it could be poured into the mould, and also were one always sure of having as hot iron as he made calculations for, the height of risers or flow off gates would, as a general thing, relieve any head pressure higher than its own.

The duller the iron is, the more apt, in moulds having risers, is the statical pressure to approach that of the pouring basin's height. Often the metal will freeze at the risers' entrance, and then again it will come up to the risers so sluggishly as to retard the flow. While the statical head's pressure may be that of the basin's height, it does not always follow that the mould is being strained the full height of the pouring head, for in some cases, if the metal is dull enough to freeze in the risers, its dullness is very apt to exert less lifting pressure upon the lifting surfaces of the mould.

The thinner the metal in lifting portions the less lift is dull iron liable to exert. Where proportions are thick, then should the risers, through any cause, "flow sluggish" or "freeze up," we are more sure a lifting pressure, the full height of the pouring basin's head, is being exerted.

There are many moulds, that were they poured direct, similar to that shown at *K*, in article of March 10, 1883, and in Figs. 1 and 5, here shown, even were the risers lower than the pouring gate, would not have their copes held down by the weight obtained from the pouring gate's head. Such styles of direct-poured moulds are productive of more momentum than any style of gated moulds generally made. The amount of weight required over and above what the pouring head calls for, to hold down the momentum force, depends upon how many ladles are used, how fast the mould is poured, the square inches of area that the metal will suddenly rise up against, and the distance of risers below pouring basins. It might also be added that these three momentum factors, to an extent, enlarge in ratio as the height of head increases above the lifting surface.

A class of moulds that generally will admit of the closest figuring, or that have the least momentum lifting pressure upon them, are those similar to the one shown in Fig. 3. Here we have the metal entering the mould, as represented by the arrow at *N*. Moulds thus poured or run from the bottom take the metal the fastest upon the start, and the rapidity of filling gradually diminishes till the end, thereby greatly lessening the force of momentum or strain upon the mould.

Were it practicable to pour like moulds, having the same sectional area of gates and heads of like height, some to be run underneath, similar to Fig. 3; the others to have joint gates, as at Fig. 4, the pouring basins to be large enough in both cases to admit of keeping them and the gates full, the joint gated moulds could be filled up the fastest, and would require the most weight to hold the copes. The reason I would assign for this is that the joint gates admit of the greatest velocity in flow.

Metal will more readily flow into air space than into a body of metal. The higher the heads and the nearer a level the metal in gates and mould approach each other, the more apparent this becomes. In pouring high vertically-cast moulds entirely from the bottom, we can often see the top portion fill up so slowly as to cause fears of its not running. Some might here say the reason for the moulds filling so much slower at the last was simply caused by there being less head pressure at the end than at the beginning. While this, of course, is correct, there are two other factors which help to retard the flow. One is the decreased fluidity of the metal, the other its weight. As an example to illustrate how the metal's weight will retard its flowing, the small cut is given. The example is simple and the experiment readily tried. As seen, the metal's highest head is at *Y*, and it escapes through the outlet *W*. By pouring a steady stream into the basin (which, by the way, is far enough from the upright *Y* to prevent any effect such as direct pouring would cause in adding to head force), and keeping it full, we will, with a head of 12″, as seen, throw up a stream about 8″ high. Now, were it not for the resistance of the air, friction of flow through the gate, and the weight of metal endeavoring to descend, the head *Y* would throw the stream as high as itself.

In the same ratio as here seen does this element retard the head's influence in rapidly filling bottom-poured moulds. After the metal has risen to that height in a mould to which the mould's height of metal's head could throw a stream into air space, then the farther filling up of the mould is simply due that non-momentum element in equilibrium of liquids that is exercised in low heads settling to a dead level. The decreased fluidity of metal mentioned has also much to do in preventing heads suddenly finding their level, and causing momentum. The duller iron is, the more cohesive it is. It can become so cohesive in a mould while being poured as to entirely stop the flow before the mould is filled.

As it is true these elements in a greater or lesser degree decrease momentum, it cannot but be seen that, with pouring basins, and underneath gates similar to that seen attached to Fig. 3, the force of momentum would be greatly decreased. In fact, when it is practicable to use such underneath gates combined with pouring basins, copes will, as a general thing, have but little momentum force exerted upward against them, and if the weight obtained from figuring the gate's head and mould's lifting area (allowing a cubic inch of iron to weigh .26 of a pound), be placed upon any ordinary weight of cope, there will be no danger of its lifting, even were there no risers to indicate when the mould was full.

A point which it may be well to draw attention to here is, the effect of directly pouring into runners instead of first having the metal enter a basin, from which it then flows to the runner, as seen in Fig. 3. This point was touched upon in article of March 10, 1883, but to more deeply go into the subject, we will notice Fig. 5 and Fig. 3. The only difference between these two pourers is, one has a basin and the other has none, except the end of the runner, as at *R*, is enlarged. Pouring direct into runner-gates, to an extent gives the momentum head-pressure equal to almost what it would figure taking *S*, the lip of the ladle, for the height of the head. The momentum that such pouring causes on forced fast-poured moulds, such as flat plates, etc., where the metal suddenly fills up to a large lifting surface or area, may be such as to call for one-half the weight more than the

height of the statical head would figure; the whole to be added to the weight of cope, to overcome the momentum and safely hold it down.

The style of gates shown at Figs. 4 and 6 are generally termed "joint gates." Moulds poured with such gates are generally subjected to much momentum, and whether their basins are such as in Fig. 3 or in Fig. 5 to a very large degree determines the momentum lifting force.

The spray gates, as seen in plan Fig. 6, not only have a lifting surface within themselves, but are generators of much momentum.

The term momentum here used, the reader is to understand, I apply to any pressure over or above the statical pressure, which may be created during the second of time that any head over or above the cope's lifting surface is being filled; also the height of pouring basins above any flow-off risers or gates, I consider as factors of momentum. For in strictly practical working, a second or so after the pouring ceases, the height of the lowest flow-off riser is that which should become the statical head, as long as the metal in the mould remains in a fluid state.

Before closing the momentum question, there is another point which it might be well to call up, which is this: We must remember that whatever pressure we subject the cope's surface to, the same is transmitted to all parts of the mould. Of course, by this it is not meant that the sides and bottom of the mould receive no more pressure than the cope's surface does. In addition to the cope's surface pressure, the mould's bottom has to support the dead weight of metal, and the sides average about one-half of the same. Taking the momentum head pressure in concert with the metal's weight in the mould, it is wonderful the amount of pressure the bottom of some moulds have to withstand.

The Indicator Diagram.

BY F. F. HEMENWAY.

IRREGULAR ACTION OF AUTOMATIC GOVERNOR.

The two diagrams, *L* and *S*, were taken from an automatic cut-off engine, cylinder 16″x30″, at eighty revolutions per minute, within a short time after the engine was erected. Along with other work, the engine drove some high-speed machinery, situated some distance away. This machinery ran unsteadily, which could be best detected by the variation in the noise it made in running —a sort of see-saw regular change from one key to another. This unsteadiness was at first believed to result from slipping belts somewhere between the engine and machinery, but investigation failed to confirm this opinion, and it was finally concluded the trouble was at the engine. Upon applying the indicator, and allowing the pencil to pass twice over the paper, the two diagrams, *L* and *S*, were the result. In taking a number of diagrams, the variation would not always be the same in extent as represented —sometimes being more and sometimes less, and occasionally, but not often, disappearing entirely for one or two strokes. The diagrams, however, fairly represent the way in which the steam was handled in the cylinder.

It was clear that for the stroke, when diagram *L* was taken, the speed was too fast, and that when *S* was taken it was too slow, the mean diagram that would indicate regular speed being represented by the dotted line. It was also evident that by the regular test —revolutions per minute—the speed was regular.

The speed of the governor was exactly twice that of the engine, viz.: 160 revolutions per minute; and it was argued that this caused the trouble, by establishing a sort of undefined *sympathy* between the motion of the engine, at the termination of the stroke, and the governor. Finally it was decided to change the speed of the governor to 190 revolutions. In making the necessary changes in the parts of the governor to adapt it to the change in speed, it was discovered that through some carelessness in fitting up, the movement was not free—to use a shop phrase, that it stuck—and this defect was remedied.

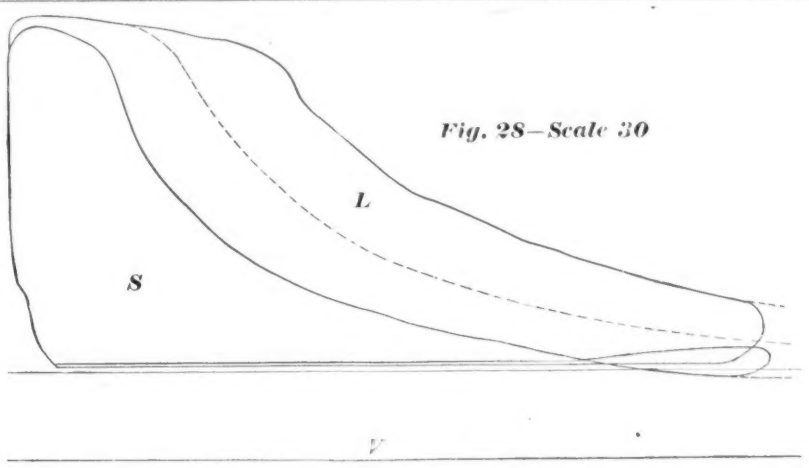


Fig. 28—Scale 30

After these two changes the governor was steady, and the cut-off regular, but no one was ever really satisfied which change accomplished this end. The imperfect fitting may have caused all the trouble, which I believe; higher speed in itself may have resulted in better action; or there *may* have been something in the speed of the governor being a multiple of that of the engine.

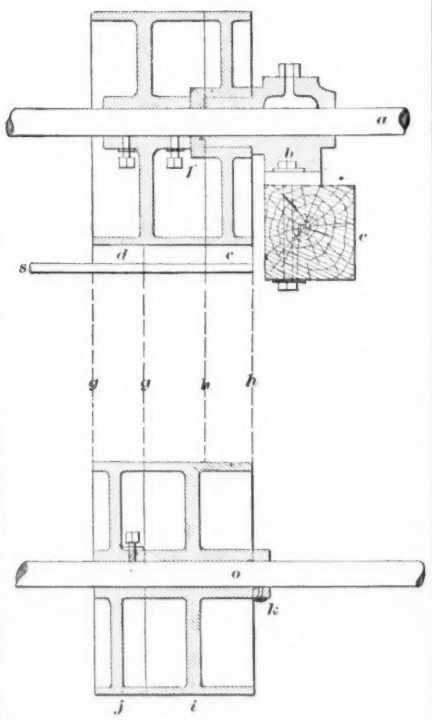
The actual loss in coal from this defective action of the governor was not large, but the loss from irregular speed—that is, in quality of product arising therefrom—was serious, and the remedy was entirely satisfactory.

LETTERS FROM PRACTICAL MEN.

Belt Transmission.

Editor American Machinist:

Among the many illustrations of the various methods of applying belts in the transmission of power, I have never seen the one illustrated by the sketch below, in which the



belt is run on fast and loose pulleys in the usual manner in starting and stopping the machine, and at same time the belt and loose pulleys can be idle when not in use, and have no bearings to keep oiled when the loose pulleys are idle.

Referring to sketch: *a* is the driving shaft; *b* is a journal box of any of the usual forms, but having one end projecting as far as the width of the loose pulley *c*. This projection forms an additional length of bearing to the shaft, and is turned off on outside for pulley to fit on loose; *c* is loose pulley as wide as the belt, and turns loose on the projecting part of the journal box *b*; *d* is a fast pulley double the width of belt; *o* is the driven shaft; *j* is a fast pulley the width of belt; *i* is a loose pulley double the width of belt, and kept in position by the collar *k*; *s* shows the position of shipper.

When the belt is in the position shown by *gg* the shaft *o* will be driven. When belt is in position of *g h* the shaft *o* will be idle, and the wide loose pulley *i* will revolve in the usual way.

When shipper is thrown so as to move the belt to the position shown at *h h* the belt, with the loose pulleys *i* and *c* will all stop, and leave no bearings of pulleys to be oiled, and save the wear of the belt, and remove all danger of becoming hot or of being damaged by neglect.

I have used the device many years, chiefly for stopping lines of shafting or parts of mills, when engine and parts of mill run day and night, or when some part of a mill were run but a part of the time.

The belt can be thrown on to the idle pulleys by the shipper *s* to the position *h h*, and if the belt is not too wide can be pulled back to the position *g h* by the shipper, as it is only necessary to crowd the belt so the edge of pulley *d* will catch the edge of the belt.

If the belt is too wide and stiff to pull on to the running pulley *d*, as above described, it is only necessary to take hold of the belt and turn it until the edge of the belt catches the running pulley *d*. This is easily done, as both pulleys *i* and *c* are loose.

The device also affords a means of oiling the pulley *c* at any time, although it only runs when belt is being shifted, but sometimes the shoulder or collar *f* needs oiling.

OLIN SCOTT, M. E.

The First Cable Railroad in England Designed by an American Engineer.

Editor American Machinist:

In your issue of June 28th you notice the completion and opening of the "Highgate Hill Cable Tramway" in London. Allusion is made in the article to the skill required to overcome the difficulties incident to the local conditions. As all notices of this event and the work, which I have seen in English papers, avoid any mention of or credit to American ability, I trust you will allow me some space in which to make a short statement.

I was employed to go to London from San Francisco to lay out and superintend the construction of this line, and under my direction the survey was made and the most difficult problem of running two cables in a single tube and that tube to be sinuous or to have reverse curves horizontally was solved by myself, as I was the first one who recognized the difficulty—that which most stress is laid upon, viz.: arranging the cable and grips to work in the single line or when both parts of the cable run in opposite directions in the same tube, and that tube sinuous. This was evolved from the brains of an American machinist whose genealogical tree was planted in Yankee land two hundred and fifty years ago. There were no cable roads in existence which presented the same local conditions that the Highgate line did, and therefore the plan, by which I mean directing and carrying the cable and arranging the principle of the grip to meet the changed conditions, could not be copied from any other road. At the same time the years of experience which I had was of much value in designing this line. I claim therefore that the successful construction and operation of this, the first cable railroad in England, is due to American intelligence and America is entitled to the credit.

W. W. HANSCOM.

San Francisco, Cal.

Melting Iron in a Country Shop.

Editor American Machinist:

Being a constant reader of your paper, and interested in foundry practice, I send you, as perhaps of some interest to your readers, what we do in a country shop. We have a cupola lined up to 28″, and use all coke. The following is an account of charge and time of melting. I may add that we keep an accurate account of all our melting:

Heat taken July 1, 1883.

Pig iron	1,000 pounds.
Machinery iron	1,400 "
Sprues	800 "
Cinder iron	300 "
Total iron melted	3,500 pounds.
Coke used	473 "
Time of melting	45 minutes.

Ayer, Mass. H. B. KELLEY, of Briggs & Kelley.

Free Trade Desires.

The New York *Evening Post* is one of the oldest and most persistent champions of free trade among daily newspapers. In its issue of July 5th is an editorial on the tariff in which it says:

When the Morrill tariff was passed it was said that the objects were to furnish a large revenue and to build up manufactures so that we need not be dependent upon foreign countries. There was an incongruity between the two, but it was not noticed. Nearly a quarter of a century has passed. The large revenue is no longer needed. The manufactures have been built up. Whether the tariff has built them up or not, built up they are—higher and more topheavy than many of us would like to see them. They have outgrown domestic consumption, and are struggling for very existence in the narrow domain of the home market.

"Many of us" of course means the free traders who are agitating for low duties, so as to have large quantities of cheap British goods imported and thrown upon our markets. To them it is a cause of regret that American manufacturers have made such progress as to render us independent of the old world for most of the articles fabricated for use. The free trader, keeping his hope alive for a total demolition of our protective tariff, and the consequent downfall of a large portion of American manufactures, does not hesitate to declare them topheavy and too numerous. A long contemplation of the effects of low duties convinces him of what will happen should his policy be adopted by our Government, and there are times when he is not too guarded to express it.

"The narrow domain of the home market" applies well enough to England, the fountain of free trade literature, but we suggest to the *Post* that some of the expressions better be changed a little when that literature is retailed to American readers. We have a great domain (not a narrow one) much of which is yet undeveloped, and manufactures are needed to give it substantial development. And in spite of free trade protests American manufactures will expand and enlarge.

A great deal of capital is being invested in Southern manufactures, but at least four-fifths of it comes from the North. New enterprises in the way of starting manufactories are set on foot in the North, and contracts made for machinery and fixtures before anything is done where the works are to be located. The South, however, is just as enterprising as any other section of the country in the matter of donating sites and granting favors to new industrial establishments.

The *Mechanical World*, after pointing out the necessity for a cheap disinfectant for workshops and places where many people are likely to congregate, gives, on good authority, the following plan for preparing a cheap and effective disinfectant—something that will quickly neutralize offensive smells: "Take half a drachm of nitrate of lead dissolved in a pint or more of boiling water, and dissolve two drachms of common salt in a pail or bucket of water. Pour the two solutions together, and allow the sediment to subside. The clear supernatant fluid will be a saturated solution of chloride of lead." This can be sprinkled around in places to be disinfected. It is said a cloth dipped in this solution and hung up in a room will instantly sweeten the atmosphere. This is worth a trial in many industrial establishments, where the health of the operatives is endangered by evil odors.

Notes of Master Mechanics' Convention.

REPORT OF A COMMITTEE ON BEST MODE AND MANNER OF EDUCATING YOUNG MEN FOR LOCOMOTIVE ENGINEERS.

To the American Railway Master Mechanics' Association:

GENTLEMEN—Your committee, appointed at the last annual convention to report at this meeting on the subject of the "Best Mode and Manner of Educating Young Men for Locomotive Engineers," beg to offer the following report:

Considering this subject to be of vital importance to the Association and to the public in general, and that proper care and attention have not been given to it in the past, the committee have spared no pains to get all the information they possibly could on this subject, knowing and feeling that men selected to fill the responsible position of locomotive engineers must possess faculties that, as a general thing, do not belong to all the human race; and as locomotive engineers have to be selected from the ranks of firemen, they feel that due care and caution should be exercised in selecting young men for firemen. Now, to arrive at a proper conclusion—one that would be satisfactory to the Association and to the railways of the country—your committee sent circulars to all the Master Mechanics in the United States, Canada and Mexico. We sent out five hundred and thirty-two (532) circulars, to which we received seventy-six replies, being an average of one answer to every seven sent. Many of these replies contain very valuable information, and were from many of the leading roads of this country, Canada and Mexico. Your committee beg leave to return thanks for the answers to their circular.

The opinions given us by the different Master Mechanics who replied were as follows: Five recommended that none but machinists should be locomotive engineers; nineteen thought that nothing more was needed than to have a young man fire from three to four years with good competent engineers to make him a good runner; fifty-two thought that one year in the shop and round-house, with two to three years' firing, was necessary to make a competent engineer; many recommended that young men, while firing, read and study books that would give them a general knowledge of the locomotive, such as "Forney's Catechism of the Locomotive," and several other works of that kind. Many of the replies admitted that machinists would make the best runners if they would consent to fire one year after having learned their trade, as they would then have the advantage of knowing all about the construction of the locomotive. Of course, when speaking of that class of men, they meant bright, intelligent young machinists—men with nerve and energy, and quick to act in cases of emergency. Of course, there are some who would never make engineers, no matter what opportunities were given them. If young men of this kind would consent to run one year or more as firemen, we could select our locomotive engineers from among that class; but they will not do it, from the belief that they are just as competent to run a locomotive as the best engineer on the road for which they are working, and if they are given an opportunity to run an engine they are certain to make a failure. This being the fact, we are compelled to select our engineers from among the ranks of the firemen, as the best and safest runners. Now, this being the class of men from which we have to select our engineers, some uniform mode of instructing them for the responsible position that many of them will have to fill in the future will have to be adopted by the different railroads in America. Your committee would therefore recommend the following:

All Master Mechanics should have full control of the engineers and firemen in the employ of their respective roads, with full power to hire and discharge the same—of course, recognizing the rights that the General Managers or Superintendents have to order the discharge of any engineer or fireman for neglect of duty.

1st. The qualifications for the position of fireman on all the railways in America should be as follows: The applicant should be from eighteen to twenty-four years old, able-bodied and in good health, with a good common school education and a fair knowledge of arithmetic, and of sober and steady habits. All applicants should be required to make application in their own handwriting, signing it in the presence of the Master Mechanic or the person he may appoint to hire that class of men. In selecting men for firemen, great care should be exercised. The Master Mechanic should endeavor, so far as lies in his power, to select energetic, smart and active young men—men of nerve and presence of mind, quick to act in cases of emergency which may occur in the position they may be selected to fill in the future. If we select men of that kind, there will be very little difficulty in educating them up to the proper standard to fill the place of engineers.

2d. There should be three grades of firemen, classed as Junior, Intermediate and Senior Firemen—the young man just commencing to be classed as Junior Fireman, and so on up to Senior Fireman; the Senior Fireman receiving the highest pay for his services, the others in proportion. When a fireman has fired four years and is worthy of promotion and fully competent to run a locomotive, there may be no vacancies in the engineer force on the road by which he may be employed. In that case we recommend that he receive a small amount more per day than the Senior Fireman (say from fifteen to twenty cents per day more), and ranked as Veteran Fireman. On the road which one of your committee represents in this Convention this custom has been in vogue for a number of years, and has worked exceedingly well. All the engineers on this road have been educated under this rule, and to-day no engineers in the country rank higher than they do.

Proper care should be taken in selecting young men for firemen as to their ability to distinguish colors in a practicable, common-sense way. We recommend that all railroads having a sufficient number of employes to justify them in so doing, have a reading-room and library for their firemen and engineers, in which the other employes could participate. The library, to some extent, should consist of works on the locomotive engine that a man with a fair education could understand. While we do not think it essentially necessary, still we believe it would be beneficial to some extent to let firemen work one year out of the four in the shop and round house, so that they might obtain a more perfect knowledge of all the parts of the locomotive.

Young men consisting of the class we have mentioned are certain to make good runners, and there will be no difficulty, at the proper time, to select good junior engineers from among that class of men. All opportunities possible should be given firemen to get such knowledge of the theory and movements of the different parts of the locomotive as would be beneficial to them when they enter on their career as engineers. To accomplish this end, monthly lectures might be given in the reading room by men of good practical common sense, who fully understand what they are talking about. If possible, these lectures should be given by one of the engineers. The firemen would learn more from him, as they would better understand what he was saying, he having formerly been one of them.

Your committee is convinced that if the mode recommended by them is adopted generally throughout the country that, if not all, a large majority of the firemen would be educated to a point from which there would be no difficulty in selecting men who will make good and reliable engineers.

3d. The fireman now being competent to run a locomotive, and being placed in charge of one, has yet some few things to learn that he did not have the opportunity of learning, from the fact that he was not running the engine. While he may run carefully and avoid accidents, he has to learn to run his engine with economy in the consumption of fuel and the cost of repairs. To learn this, and to give the young engineer an opportunity to become a first-class man in his occupation, we recommend there be three grades of engineers—first, second, and third grades—and that the remuneration they receive be according to grade; the fireman just promoted ranking in the third grade; after one year's service he enters the second grade; when two years have passed he enters the first grade, and becomes a first-class locomotive engineer.

Your committee is confident that if the different railways in the country will pursue the mode and manner laid down in this report, there will be no further difficulty in selecting good and faithful men to fill the responsible position of engineer. They recommend the adoption of this report.

Respectfully submitted,

JOHN H. FLYNN, Chairman.
J. N. LAUDER,
C. K. DOMVILLE, } Committee.

Mr. Sprague took exception to several parts of the report, and expressed the belief that it was absolutely essential that firemen should spend a year in the shop before being put in charge of an engine.

Mr. Flynn said it might be necessary in some parts of the country for firemen to spend a year in the shop, but he did not find it was necessary in his section. He had young engineers who were second to none in their ability to run locomotives successfully, and they had never spent a day in the shop. These men do small jobs about their engines such as setting out packing and they learn that work while firing by helping the engineer to do it. He did not believe in putting machinists on engines unless they are satisfied to go through a regular course of firing. From his own experience he found that machinists thought they knew how to run an engine without learning the business. He had gone through that mill and was ready to teach the engineer his business during the first trip he made as fireman. Some experience showed him his folly.

Mr. Lauder did not think they had to be contented with average men as firemen. It appeared to him that there is not a young man in the country but wants to go fir ing. This enables them to have the very best men to choose from. He thought spending some time in the shops would be an advantage to firemen, although not essential to their success as engineers. The greatest trouble he has with engineers is in getting them to leave their engines alone. He wanted them to run the engines, not to repair them, and he would not even have them set up wedges.

Mr. Johann thought that an engineer should not only be able to run his engine, but he should be able to do all repairs. He wanted engineers educated up to that point, and believes that it will come round in course of time. He makes firemen from boys who are taken into the shops as wipers; after they do wiping for a year or two he puts them helping machinists where they learn the details of the engine and how work is done. A year at that work makes them ready to go out as firemen. He finds this plan works well. He does not hire engineers unless they are willing to take a turn at firing, so that they will have an opportunity to learn the ways of the road.

Mr. Setchel had made a study of how to get the most competent men as engineers. The lesson he learned from the engineers' strike on the Little Miami road was, to raise his own engineers. That plan he had adopted with the most satisfactory results. When the young men around found that they were raising their own engineers, he was crowded with petitions for places as firemen, young doctors, lawyers and preachers being among the applicants. This gave them excellent material to select from, and they had done so judiciously, till now they could man every engine on the road should the engineers quit without warning. They followed the system advocated in the report, and it worked well. He made a strong plea in favor of sober men, and said that most of the trouble with engineers originated in drink.

REPORT OF COMMITTEE ON SHOP TOOLS AND MACHINERY.

Your committee on shop tools and machinery beg leave to report that we issued the following circular:

CINCINNATI, October 10, 1883.

To the Members of the American Railway Master Mechanics' Association:

The undersigned, your Committee on Shop Tools and Machinery, respectfully solicit replies to the following questions:

1. To what extent are you milling work, either in fitting or finishing? Do you consider it desirable to extend the use of milling machines in locomotive work?

2. Do you use any machines other than the ordinary slide lathe for making and threading bolts, set screws, or studs? If so, please describe them, or give name of machine and state advantages.

3. Are you using grindstones, emery wheels, or belts for finishing work? If so, please state what kinds of work and the advantages over ordinary methods.

4. Have you any special tools for cleaning, scarfing, or welding tubes? If so, please give maker's name, or, if possible, send drawings and state advantages.

5. To what extent do you use dies and formers in smith shop, and with what advantages?

6. Have you any improved machinery or any special tools or devices (however simple) not in general use, that improve or economize work? If so, please give maker's name, or, if special, describe; and, if possible, send drawings and state advantages.

We trust the members will realize the necessity of furnishing full information upon this important subject, that the Committee may submit a useful report to the convention.

Replies to be sent before April 1, 1884, to H. N. Sprague, of H. K. Porter & Co., Pittsburgh, Pa.

To the above, fourteen replies only were received from members, and some from tool builders to whom your Committee sent circulars. On question first:—Nine reported in favor of extending the use of the milling machine on locomotive work. The Brown & Sharpe Manufacturing Company say, "We are constantly increasing the milling facilities in our works, as being able to use cheaper help, the work in most instances being performed more quickly, and always with greater uniformity, besides leaving the parts so much smoother as to save time in finishing." H. N. Sprague has milled all rod brasses for many years, and can do as much or more on one plain milling machine as on two planers or shapers, with cheaper help and much more accurately, saving greatly in time of fitting to strap. He submits blue print of adjustable cutter, so arranged as to compensate for wear, thereby keeping standard size of cut. Three members report in favor of using milling machines to a certain extent; one has no use for milling machines, and two do not report on the question.

On question second:—Six reported that they are making and threading all studs, set screws, and tap bolts on a turret head or stud machine, and all claim from three to five hundred per cent. advantage in time over the ordinary lathe, with unquestionable advantage in uniformity. Seven report only using slide lathe and bolt cutter.

On question third:—Eleven report using grindstones and emery wheels for roughing and finishing work to considerable extent, some doing all finishing that way. H. N. Sprague does positively all roughing for finish, and all finishing of steel and iron forgings, brass and iron castings, and brass and copper pipe on grindstones, solid and covered emery wheels, emery bolts and rollers (using solid gum rollers laid with emery wheels as small as one inch in diameter), and walrus leather wheels for polishing spherical surfaces, working six first-class men, in a total force of less than 230, and considers it the best investment the firm has, effecting a saving in files, machinery, and labor, doing all this class of work as well and much of it better than by the more expensive processes.

On question fourth:—Thos. B. Twombly, reports using H. V. Hartz flue machine. Has not had it in use long enough to determine its merits. We trust he will be able to report fully at the convention. James Sedgley also uses Hartz and Fise machine, doing

better work and cheaper than by hand. He submits blue print of the machine. J. S. Graham uses the same machine with excellent results. J. O. Noble is using Charlton's hand machine for welding flues, two men welding seventy-five flues in a day. Other members report only hand-welding.

Hosts of the members, having much flue work to do, report the use of cleaning barrels.

Geo. F. Morse, Portland Locomotive Works, cleans flues by slinging them into endless chains suspended on revolving pulleys, applying sand and water, and allowing them to grind together by the motion of the chains.

W. H Stearns uses self-feeding clamp and three rolls for cleaning flues, but does not explain the construction of the machine further, or the process of cleaning.

On question fifth:—Members generally report using dies and formers more or less extensively.

Allen Cook reports using spring dies under steam hammer, saving time and help, and producing more uniform product.

H. W. Sprague uses spring dies and formers for most shapes under hammer, also heads all pins for valve motion and similar work under steam hammer in steel dies, counterboring for head in die, cutting off material by cutting-off machine to accurate length, saving material and considerable lathe work; as the heads are formed concentric with the body and of uniform thickness, very little stock is required to finish.

On question sixth:—The only response is by H. N. Sprague, who submits blue print of special cutter for milling rod brasses mentioned in question first, and overhead crane for general shop use, having eight of them in use in machine and erecting shops and one in boiler shop, and thinks he could not keep house without them. On the suspended hook he hangs chain blocks or screw hoists; he prefers the latter for lifting or lowering work; the turning of the beam on its center at opposite end, and this motion, together with the travel of the hook on the bar, allows work to be moved to any point covered by the track. Your committee confesses to grievous disappointment at the ignoring of this question by the members; and we are still convinced, notwithstanding our reported failures, that much valuable information could be furnished by members, who, doubtless, all have some better way of doing some one or more things than their neighbors, and we presume the cause of its failure is fairly voiced by one member, who says, in answer to it: "Nothing but some small tools about the shop that enable us to do the work quicker, and I suppose every shop has some of its own kind." Economize time, and yet too simple to report for the benefit of his fellow-members, in response to a request to give anything (however simple) that improves or economizes work. Surely the age of small things must be passing away. We are glad to note an increased number of replies, as compared with five received three years ago on the same subject, but submit the little interest taken, indicated by fourteen replies in a membership of nearly two hundred and fifty. Money takes more interest than that. One feature to which we are glad to bear testimony is that our progressive members are thoroughly satisfied with the advance ground they have reached, and are confident that in this direction lies success.

After carefully reviewing the subject from the best standpoint obtainable, your committee feel safe in recommending the use of a stud machine in all shops having sufficient work of a kind suitable for such a tool to keep one ordinary lathe occupied, as the saving of labor on that amount of work would much more than pay the interest on the difference in cost between the two machines, while the capacity for more and quicker work, as well as greater uniformity, is of still greater importance. We also recommend, in the interest of uniformity, that all bolts, studs and set screws be cut, or at least finished, in dies. The economy of roughing and polishing with grindstones, emery wheels and belts, we would recommend to your earnest consideration; and, while we think the work of the milling machine can be extended to advantage, we are aware that its best results, aside from tool-work, can be reached in large shops working on duplicate parts.

Finally, we believe the age of special tools and machinery has come to stay, and that those who adhere to old-time notions of doing work—getting one machine to do many kinds of work, doing no kind economically or accurately—will certainly get left.

The logic of the aggressive competition in mechanical advancement points unmistakably to the survival of the fittest.

Respectfully submitted,

H. N. SPRAGUE (of H. K. Porter & Co.),
JOHN BLACK (C., H. and D. R. R.),
J. K. TAYLOR (O. C. R. R.),
Committee.

One of our foundry correspondents, Robert E. Masters, of the Columbus (Ga.) Iron Works, says, in a recent letter: "I want to ask you to let me know what the circulation of your paper is. One of our men, just in from Mexico, says you can find the AMERICAN MACHINIST in every little town. I believe fully 50 AMERICAN MACHINISTS are taken here. I know parties who take over half that number."

The Craig New-Method Lubricator.

This lubricator, which we fully illustrate herewith, embodies, it is claimed by the inventor, the second original patent ever issued on a method of lubricating steam engines.

The method involved in its operation is to first cause water to pass visibly, in drops, through a liquid of less specific gravity than that of water, and incapable of chemically combining therewith, and afterwards to pass into the oil used for lubricating, so as to elevate the same within the oil reservoir to the eduction passage and discharge it therefrom into the engine or part to be lubricated. By this method a clear sight is obtained of the drops of water of condensation while they may be passing through the sight chamber to the oil reservoir, whatever be the color or character of the oil used for lubricating.

It is claimed by this method the feeding of the darker and nearly opaque oils can be measured with as much accuracy as the very light and clear oils can be.

In the engravings, Fig. 1 represents Class A lubricator; Fig. 2, Class B, and Fig. 3 a section through Fig. 2. Class A, as shown, is designed to set on the side of the engine, or on a shelf in the engine room, and may be piped to carry the oil a considerable distance for discharge. They are also made to suspend from the steam pipe, the same as shown by Class B, Fig. 2. It is also provided with glass tubes instead of glass plates, the same as Class B.

To operate the lubricator: Close valves *A*, *C* and *E*; remove plug *G* and fill the measuring chamber with a light, clear oil, or any fluid lighter than water, and incapable of chemical combination therewith; then replace plug and open valve *E*, when condensation will take place in the condenser *B*, filling it with water. This only occurs on the starting of the cup; or should you wish to refill or replenish the oil or fluid in the measuring or sight chamber, then open valve *I* until the hopper is wide open, and fill your oil reservoir with any kind of lubricant you may choose to use for lubrication; close and open valve *A* or *C* one turn, and control the feed by either valve *C* or *A*, as per observations made at the glass window in the measuring chamber of drops of water falling to the bottom, from which place it is allowed to pass into the oil reservoir to displace the oil, or lubricant, as fast as it may be required for lubrication. The lubricant so displaced passes down a channel formed on the inside of the cup and discharges through valve *F* (which is always open) to the steam pipe of the engine. When the oil is all fed out it will show water at glass *D*, then close valves *A* and *C*, open valves *J* and *I*, draw off the water, close *J* and fill reservoir as before.

This lubricator is made by the Craig Double-Sight Feed Lubricator Company, Lawrence, Mass.

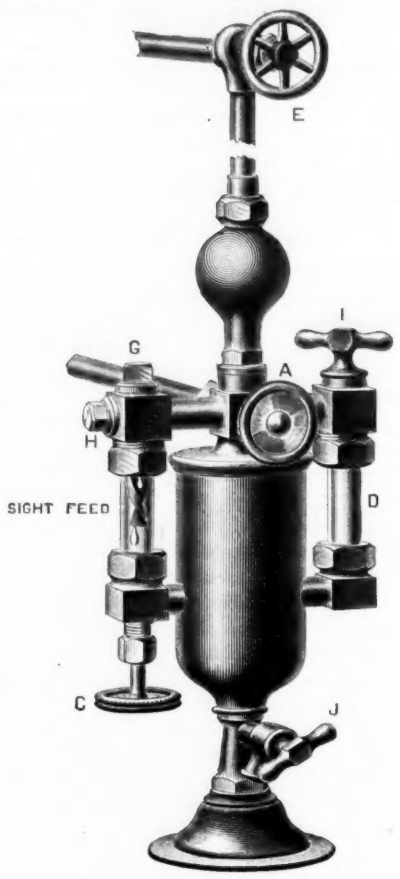


FIG. 1.

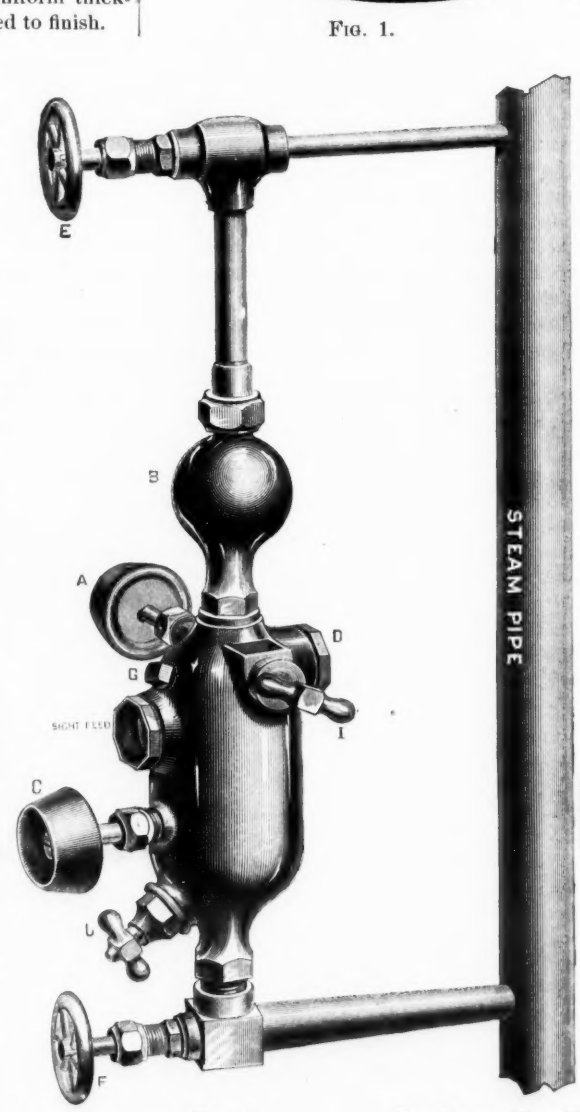


FIG. 2.

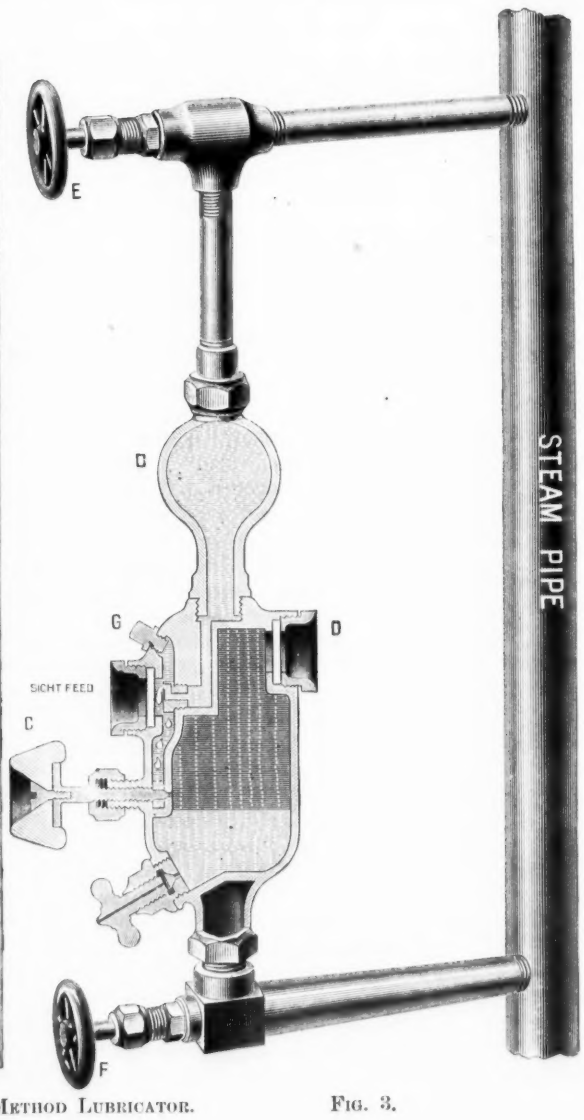


FIG. 3.

THE CRAIG NEW-METHOD LUBRICATOR.

What it is said will be the largest steam crane in Europe is being erected at Hamburg. It will be capable of lifting a weight of 150 tons. The next largest is at Antwerp, which has a lifting capacity of 120 tons. The large crane at Woolwich will lift 100 tons.

The *Slate Trade Journal* says: Slate for roofing costs $4.50 per square, and lasts 60 years; shingles cost $4.00, and last 12 years.

The coopering business is spoken of as being very low at Chicago. No wonder! with one penitentiary at Michigan City in front, and the Joliet prison in the rear, both manufacturing barrels at convict rates.—*Minnesota Mirror.*

A competitive trial of windmills will take place at the Pennsylvania State Fair in Philadelphia from September 8 to September 20. During those twelve days nobody will be permitted to touch the machinery. All makers are invited and nobody will be charged for space. The mill that raises the most water will be accounted the best.

Engineering pays the following compliment to American enterprise:

The object of the individual American is to get on in the world, and thus instead of the scheming and inventing being left to a distinct branch or class, every man is eager to add his little improvement to the trade or calling he follows.

To the above, and going a good way towards accounting for it, might have been added that the individual American is, on the whole, better protected in property rights in his "little improvement" than the individual of any other country in the world. The incentive to make such improvements is neither more nor less than their money value.

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NEW YORK, JULY 26, 1884.

CONTENTS.

	PAGE
Automatic Flanging and Double Seaming Machine for Sheet-Metal Vessels	1
Thoughts and Hints on Boiler Construction. By George Marshall	1
The Farmer-Calder Rod Packing	2
Mechanical Engineering Department of the State University of Illinois	2
Birkenhead's Rotary Tool Post	3
Hand-Truck Crane	3
Momentum and Rules for Weighting Copes. By Thomas D. West	4
The Indicator Diagram. By F. F. Hemenway	5
Letters from Practical Men—Belt Transmission—The First Cable Road in England Designed by an American Engineer—Melting Iron in a Country Shop	5
Free Trade Desires	5
Notes of Master Mechanics' Convention	6
The Craig New-Method Lubricator	7
Building up Foreign Trade	8
The National Bureau of Labor Statistics	8
Manufactures	9
Questions and Answers	9
Machinists' Supplies	10

Building Up Foreign Trade.

American manufacturers, while fully alive to supplying the home market, fertile in expedients to meet or anticipate demands, have much to learn from European manufacturers in the way of building up foreign trade. Let a demand for manufactured goods, particularly for machinery, develop itself anywhere, and the representatives of English and French houses will be found on the ground industriously working up business. They appreciate, instinctively, that trade will not look after them, that they must seek the trade, and, what is to the point, they thoroughly understand the advantages of being first in the field. In respect to guiding trade in desired directions, aggressiveness is absolutely essential. Custom—habit—is a thing not easily changed, and those who commence buying goods of some particular manufacture are not easily turned in other directions. It is this quality of aggressiveness that American machinery manufacturers, when it comes to looking for foreign custom, lack. Sitting quietly at home, depending on the good quality, or even cheapness, of products will not answer the purpose in such cases. The matter must be brought personally and persistently before desired customers—something that American manufacturers are not backward in in regard to home trade, but seem to fail to appreciate the greater necessity for in foreign trade.

European countries have one advantage in respect to foreign trade not possessed by this country, viz.: the lower rate of wages prevailing there operates to induce European engineers and mechanics to accept situations in countries in process of mechanical development that would not be accepted by Americans, and the preferences and influences of those accepting such situations are naturally in favor of trade with the countries from which they come. This has been found in many instances to have had considerable effect against American enterprise abroad, but, after all, this is at the most only a hindrance. Notwithstanding this, and perhaps some other advantages possessed by European countries, there are unimproved opportunities for introducing American machinery abroad that require only persistent effort to yield good results. But the effort must be persistent and early.

The dull times have brought out some of the same old complaints about cutting prices in selling machinery which were heard so frequently six or seven years ago. Then, well managed shops often found it difficult to make any net profit at all. Buyers were not assured of any stability to prices of certain kinds of machinery. When machinery in manufacturers became firm on prices trade improved. They had not sold any more machinery by cutting prices. It was only throwing away legitimate profits. The experience of that era of price cutting is not likely to be repeated. About all the older establishments have put their business in order to withstand a new era of depression, should it be forced upon them. Some of the younger establishments may not be so well prepared for dull times, and may be tempted to cut prices. But the result is not likely to prove satisfactory to those who pursue this policy.

This is the month for taking stock in many manufacturing establishments. There are different ways to estimate the value of stock on hand and the value of tools in use in machine shops. By marking up the value of stock on hand the books may sometimes be made to show a good profit, where others would figure up a loss. It is well to estimate stock on hand considerably less than the regular selling price. One of the largest machine manufacturers in this vicinity marks off fifteen per cent. from the last previous valuation of tools and machines in use at each annual stock taking. Some others mark off only five or ten per cent. Unless a liberal allowance is made for deterioration the owners of a shop are likely to be surprised sooner or later by the results of miscalculation.

The National Bureau of Labor Statistics.

Congress, just before adjournment, passed a bill creating a National Bureau of Labor Statistics, and the bill immediately became a law by having the President's signature attached. The efficiency of the bureau will depend almost entirely upon the man appointed as its chief. John Jarrett, of Pittsburgh, the former President of the Amalgamated Association of Iron and Steel Workers, has received the appointment. His experience in labor matters ought to qualify him for the position, and the bureau should show substantial results. Doubtless he will be acceptable alike to manufacturers and workmen whether inside or outside of combinations or trade unions. Some months ago a bureau of labor statistics was created for the State of New York, and Charles F. Peck appointed as its chief. Great results were anticipated as the material to work upon in the Empire State was inexhaustible. We should very much like to hear whether anything has been accomplished by that bureau. A news item in the daily papers noted the presentation of some kind of a report to the legislature by Mr. Peck. We wrote to Mr. Peck at Albany asking for a copy of the report, and for any further facts about the operations of the bureau. No reply was received. At the same time we wrote to the State railroad commissioners at Albany for a copy of their report and received it promptly and have received, since then, copies of supplemental reports made by those commissioners. The next we heard of Charles F. Peck was news in the daily papers that he was attending a national political convention a short time ago as one of the shouters for a candidate. It is to be sincerely hoped that the United States bureau of labor statistics will not be run as one of the cog-wheels of the political machine, but that it will be conducted solely in the interests of productive industry, as have been the State bureaus in Massachusetts, Pennsylvania and Ohio.

Troubles from sudden freshets and prolonged drouths are not the only ones incidental to those who depend entirely upon water power. A company in Waterville, Me., that employs 100 hands, has brought suit against other mill owners on the Kennebec above them to prevent the defendants from loading the stream with saw dust and other refuse to the great damage of the plaintiff. At last accounts the case was being tried. The mills in Maine have been idle so much of the time by reason of low water during the last two years that it must be discouraging when the stream is full to have turbines choked up and stopped by floating debris. When the quantity of water is just right it is provoking to have the quality bad. There is only one way to effectually and permanently prevent those difficulties with water power—that is to put in a good reliable steam engine. The continuous running of the mills as long as desired will then be assured.

When manufacturers pay by the piece instead of by the day or hour they are sometimes urgently reminded of defects in their machinery or appliances used in production. Notwithstanding the depression of trade among the mills in Fall River, and the consequent surplus of labor, it is said that several of the mills are in want of operatives and find it very difficult to obtain and keep a full supply. The reason is that those mills have old and badly worn machinery, and are badly lighted and ventilated. The operatives are paid by the yard, and it requires more time and is a greater strain upon the physical constitution to finish a given number of yards of cloth in those mills. The newest mills are introducing substantial improvements, and some of the old ones will certainly get left unless they adopt the same policy.

Up to the present year iron mills in Cincinnati were obliged to pay their workmen more for the same amount of production than the mills of Pittsburgh, because the former were not as well equipped for rapid work. This year the scale of prices is the same in both localities which would seem to indicate that the Cincinnati mill owners have been impressed with the desirability of making improvements.

In machine shops that have the best tools and facilities for doing work, not only does the work cost less but there is less difficulty in obtaining the kind of help wanted.

Although the quickest time of crossing the Atlantic has been repeatedly chronicled during the past three years, there is no evidence that the end, in this respect, has come yet. It having been demonstrated that quick passages can be as safely made as slow ones, no one in the future will be satisfied with a passage in nine or ten days. It looks as if the days of mixing passengers and freight were about numbered, or at least as if there are hereafter to be steamships running upon about the same basis as limited express trains are now run upon railroads.

As showing with what interest technical education in this country is looked upon in England, it is noticeable that the London *Times* recently reviewed the subject at length, and in a way to show that considerable pains had been taken to obtain information. The tenor of the article in the *Times* is in almost every way flattering to the technical schools in this country, the workshops connected with them being noticed at length. In England the opinion prevails very extensively that in order to keep up in the race for manufacturing supremacy, free technical educational facilities must be provided; and, while in this country we look upon England as ahead in this respect, it seems that contrary opinions prevail there.

It must have been noticed by those interested in such matters that the Master Mechanics at their annual conventions, although their field would appear comparatively limited, manage to consider a large variety of subjects of the most practical nature, in this respect comparing most favorably with other societies having a much wider range of topics for legitimate consideration. One—perhaps the chief—reason for this is their custom of appointing committees to gather information on definite subjects during the year, and present it to the convention, when the subjects naturally come up in the best possible form for discussion. Perhaps another reason may be found in their custom of devoting time to short discussions on subjects that may be brought up, without the formality of regularly prepared "papers." Whatever the reason may be, there appears to be more general interest, of the members, at the conventions of Master Mechanics than in other kindred societies, and their methods for securing this interest may be worth study, and perhaps imitation.

Some of our exchanges are favorably noticing an English plan for preventing accidents to workmen accidentally thrown against a fly-wheel, the plan, so it is said, being to fill in around the arms of the wheel with wood. We would suggest that an easier and better plan is the one generally adopted in this country, viz.: to "fence" the wheel in, so as to avoid the possibility of being thrown against it.

Sand plays an important part in railroading, and but few railroads are satisfied with their means of drying it for use. If some one who knows by experience of a satisfactory arrangement for this purpose will furnish the particulars, we shall be glad to publish them for the benefit of others.

"I intend to take your paper as long as I live, if I have to take the clothes off my back to pay for it," writes one of our West Virginia readers. This is certainly emphatic enough.

The daily press gives frequent notes of railroad companies keeping back the wages of their employes. In some cases small riots have been caused by thus withholding the money due workmen. There should be mechanic's lien laws in every State to apply

to such cases. Several railroads are borrowing money to meet interest on bonds and current expenses. The longer they pay interest the more it costs, hence some of them obtain forced loans without interest from their employes.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(280) S. O., Denver, Col., asks: Can you tell me of a successful plan for cleaning dirty waste? *A.*—We do not know of any plan for cleaning waste that has been found profitable.

(281) Constant Reader, asks: 1. What is the proper heat to keep the pots at in case-hardening? *A.*—Light red. 2. What is best to keep case-hardened work, such as screws, from rusting? *A.*—Keep them well oiled.

(282) R. K., Columbia, S. C., writes: I am building a house, and wish to know if ¼″ gas pipe will do for a lightning-rod, fastening the rod to the house with staples, and letting the end terminate in a heap of iron chips down in the ground. I can make the connections with elbows and tees, using points for the ends? *A.*—¼″ gas pipe, we should say, would not be large enough. The best authorities on the subject say a conductor should not contain less than ⅛′ of metal in its cross section. Ganot recommends that where the ground end cannot be led into a well it should be led into a hole in the ground, six or seven yards in depth, and that the hole be filled with powdered coke. He also recommends the use of wire cable as being readily brought into proper shape. It may be held in position with iron staples.

(283) G. F., Elgin, Ill., writes: I have a common cistern pump. There is a 1¼″ nipple next the pump, then 8 feet of 1½″ pipe. What I want to know is, will I have to lift all the water due to the area of the 1½″ pipe, or only that due to the area of the 1¼″ nipple? I claim only that due to the area of the nipple, and that the friction will be less with the 1½″ pipe than if the whole length were 1¼″. Am I right? *A.*—You are partly right and partly wrong. Neither the size of pipe nor nipple have to do with the work of raising the water, except so far as friction is concerned, and, as you say, there will be a trifle less friction in the large pipe than if it were smaller. The resistance against which you have to work is due to the size of pump, and would be no more if the pipe was 6″ diameter for its entire length.

(284) W. E. C., Waseco, Minn., asks: 1. Is there any way of casting on steel, so as to have it adhere firmly, where only one flat surface of the steel comes in contact with the casting? *A.*—Yes. The process is similar to that of burning or welding cast iron. An article on uniting steel to cast iron, in the AMERICAN MACHINIST of March 1, 1884, contains the necessary information. 2. What is the best way to chill a small portion of the surface of a cored casting, rather chunked, weighing from 200 to 300 lbs.? *A.*—To this question Thomas D. West replies as follows: Make a chill in face no larger than the area of part to be chilled, having it long enough, so that when rammed up in the core it will be supported. After the core is dry, coat the face of the chill lightly with oil; or the face may be blacked over when blacking the core, provided the blacking is mixed with one-half black lead, and not beer or molasses-water.

(285) E. M., Nashua, N. H., writes: 1. An indicator being applied to my engine, about one year ago, I found one steam valve leaking. The valves were set so the engine took a good card, but I am not satisfied yet. The engine, when disconnected from the water wheel, will not start at every point off the center until reversed by the wrist-plate, so as to open that valve nearly full. Please tell me if you think that is just right? *A.*—The engine should start anywhere, with the crank a few degrees beyond the center, up to the time the steam valve closes. The distance off the center at which the engine will start will depend, to some extent, upon the load on it. There may be some fault in the valve setting If you will send us a pair of diagrams, we will try and help you. 2. What benefit is derived from clearance in an engine cylinder? *A.*—There is no benefit from it. Clearance is a necessary evil.

(286) W. C., Richmond, Me., asks: 1. What is the highest temperature at which water can be drawn by an injector? *A.*—It depends upon the height it is to be drawn, and upon other circumstances. Generally speaking, about 150°. 2. How much heating surface would there be in a boiler of the locomotive type, with fire-box 10″x16″x11″; 30 brass tubes 22″ long and ¾″ diameter? *A.*—About 13 feet. 3. Will boilers steam better with one or with three gauges of water? *A.*—Sometimes with one and sometimes with three. Generally with two. 4. I am running an engine 8″x20″, and about once a week, after shutting down, I put about a gill of oil in the cylinder. Do you think this a good plan? *A.*—We think the oil supplied the cylinder in the way stated does no particular good. 5. What power will a condenser add to a Harris-Corliss engine 16″x48″, running 60 revolutions with 85 lbs. steam pressure? *A.*—Probably from 20 to 30 per cent.

(287) W. W. F., Morgantown, W. Va., writes: 1. I am running a 20-horse power engine, and have trouble with the rod brasses. The strap is round-ended, a half-round brass fitting it, and the brass fits loosely in the strap, and pounds. Can you tell me how to remedy this? *A.*—The best way is to have a new strap made that will take a square box. Half-round boxes in connecting rods are almost invariably troublesome. If you will fit your brasses to pin so as to key them hard together, brass and brass, you may hold them still. 2. How much lead should an 8″x16″ engine have, with double slide valves? *A.*—Probably 1-32″ will be sufficient. Give whatever lead you find the engine to run stillest at. 3. Is not lead given to an engine to prevent its pounding? *A.*—Lead is given to an engine—when it is given—to insure having pressure behind the piston at the beginning of the stroke. What its effect will be on smooth running can seldom be told, except by trial, as it may be quite different in different engines. It will make but little difference otherwise with your engine, whether it has 1-32″ or 3-16″ lead, hence give it such lead as it seems to run best with. 4. What is the weight of a cubic foot of sandstone? *A.*—According to Trautwine, 151 lbs.

BUSINESS SPECIALS

Transient Advertisements, 50 cts. a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Mackenzie Cupolas and Blowers, 245 Broadway, N.Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N. J.

Steel Name Stamps, &c. J. B. Roney, Lynn, Mass

Interchangeable work a specialty. Send stamp for new Lathe Catalogue. E. O. Chase, Newark, N. J.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John street, N. Y.

Fine tools and special machinery. Horace Thurston, 84 Clifford street, Providence, R. I.

Herbert W. T. Jenner, Mechanical Engineer and Solicitor of Patents, 632 F st., Washington, D. C.

Lyman's Gear Chart. How to lay out gear teeth. Price 50 cents. E. Lyman, C. E., New Haven, Conn.

Foot Power Machinery, for workshop use, sent on trial if desired. W. F. & John Barnes, Rockford, Ill.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Pattern and Brand Letters. Vanderburgh, Wells & Co., corner Fulton and Dutch streets, New York.

Consulting Engineer and Mechanical expert, C. C. Hill, 84 Market street, Chicago, Ill.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

National and box chucks, foot and power lathes, and slide rests. Lodge, Barker & Co., Cincinnati, O.

For illustrated price-list of the finest planer chuck in the market, write to Durkee & Keffer, Chicago, Ill.

Split Pulleys at low prices, and of same strength and Appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

DRAWINGS — Mechanical, electrical and Patent Office. All styles of artistic designing. Special facilities. Low rates. Wallace Metcalf, 140 Nassau St., N. Y.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Improved Tack Machinery, made by The Willets Man'f'g Co., can be seen in operation at their works, 57 Clifford St., Providence, R. I.

The "Wax Process" Engravings shown in the AMERICAN MACHINIST each week are made by Struthers, Servoss & Co., 32 Frankfort Street, N. Y.

Difficult machines invented and built; coarse screws cut. V rotary files for fine milling, by mail 50 cts. Tower Machine Works, E. Brookfield, Mass.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham St., N. Y.

The Complete Practical Machinist, $2 50; the Pattern Maker's Assistant, $2.50; Mechanical Drawing Self-taught, $4 00; books for practical machinists. Address, Joshua Rose, Box 3,306, New York City.

EXTRACTS FROM CHORDAL'S LETTERS, 400 pages, 12mo., handsomely bound in cloth. New and enlarged edition, with over 50 illustrations. Price $2. Published by John Wiley & Sons, 15 Astor place, New York.

For a strictly first-class automatic engine, from 10 to 60-horse power, apply to the Straight-Line Engine Company, Syracuse, N. Y.; medium or high-speed; perfect balance; fewest parts and fewest working joints; uniform speed at all ranges of power or steam pressure; the best material and workmanship in all vital parts; the most correct distribution of iron; unexcelled in smooth running.

MANUFACTURES.

A new foundry is to be started in Danville, Va., by Ohio capitalists.

A. J. Fullam, 423 Eleventh avenue, New York, will erect a $4,000 workshop.

Powers & Hays have just completed their large machine shops at Shelby, N. C.

A linseed oil company has been organized at Lacrosse, Wis., with $100,000 capital.

C. G. Banks, Brenham, Texas, contemplates adding a foundry 48x74 feet to his machine shop.

The Albany Water Company, of Albany, Texas, has been incorporated to build water works. Stock $10,000.

It is reported that General Wilder, of Chattanooga, Tenn., contemplates putting up a 100-ton furnace at Bristol, Tenn.

The National Convention of the Amalgamated Association of Iron and Steel Workers is to be held in Pittsburgh, August 5.

John Keppelmore, of the Union Foundry, Reading, Pa., has organized a stock company for establishing a cast-steel foundry there.

The Cumberland Steel Works Company, Cumberland, Md., will be organized with a capital of $150,000. Will enlarge present works.

The Goss Marine Iron Works, Bath, Me., are to build a triple expansion engine for the steamer Meteor, whose original engines were a failure.

L. V. Walkley is at the head of an establishment building a new tack fac'ory, in Plantsville, Conn. The building is to be 100x30 feet, with a wing 30x30 feet.

The new foundry and machine shop in Catasauqua, Pa., has been compelled to increase its force of workmen and to erect a large frame addition to its works.

The Aland Blower Company, Rome, N. Y., have in contemplation the erection of a large building next their machine shop to be used for a finishing and store room.

The merchants of Palestine, Texas, have organized a joint stock company, with a capital of $15,000, for the purpose of manufacturing cotton gins.—*Brenham Banner.*

The Harrison Boiler Works, of Philadelphia, write us: Glad to report we are very busy, and have orders for our improved safety boilers to keep us so for several months.

The Wellville (O.) Rolling Mill Company, which has been boring for gas, struck it at the depth of five hundred and forty feet, and will use it for fuel through the works.

Denison, Texas, wants a cotton factory. A capitalist from Shreveport will furnish $15,000 if the citizens will subscribe $25,000. It will give employment to fifty operatives.

The Spencer Arms Company, of Windsor, Conn., will build a 40x75-feet blacksmith shop this summer. They are having good success with their new military rifle and their shotguns.

George A. Rollins & Co., builders of the Rollins automatic cut-off steam engine, Nashua, N. H., have their new shops nearly completed, and are setting up the tools for engine work.

The Richmond (Me.) Machine Works are being built by Joseph O. Dunham. In a recent issue we had it Richmond, Ind., by mistake. The Richmond (Ind.) Machine Works is an old-established firm.

The Lawrence Machine Works (S. S. & W. O. Webber), Lawrence, Mass., have issued an illustrated circular of the balance dynamometer. The instrument seems to meet with favor where it has been used.

The Bay State Hose Coupling Company, of Worcester, Mass., has brought out an excellent style of hose coupling. No tools are required to apply it, and it holds better than almost any other coupling in use.

The strike of the iron moulders at Newcastle, Pa., ended July 8., Baldwin & Co. withdrawing their notice of reduction. The same action has been taken by Bradley & Co., of Pittsburgh, and work was resumed.

The Twist-Drill and Bit Company, of Rockford, Ill., has been incorporated. Capital stock $75,000. Incorporators—Jas. P. Thompson, Harry W. Thompson, and Robert H. Tinker. They will engage in the manufacture of tools of all kinds.

The Brown & Sharpe Manufacturing Company, Providence, R. I., has just issued a new 64-page illustrated catalogue of their tools and machinery. The pages are large and the representations of machines all that could be desired in a catalogue.

Fairbanks, Morse & Co., of Chicago, have contracted with the Westinghouse Machine Company, of Pittsburgh, to control exclusively the sale of the Westinghouse automatic engine for the Western States and Territories. The agreement dates from July 1.

The Wiley & Russell Manufacturing Company, Greenfield, Mass., is to erect a building 50x30 feet, two stories high, with a basement under one end 29x21 feet. It has already been leased to C. Wing, who will there carry on his pattern making and machine jobbing.

The Sandy Hill Iron and Brass Works, of Sandy Hill, N. Y., still keep extending their works and increasing their capacity. They have lately made an arrangement with J. Cornell, by which his services will be employed, and his machine shop will be run on work of this company.

It is stated that there are 1,463 children under 14 years of age employed in twenty-eight factories, at Grand Rapids, Mich., despite the law. It is also said that in some Connecticut cotton mills children are employed at six years of age. The authorities seem to be afraid to enforce the laws.

The New England Steam Gauge Company, of Boston, has leased power and room of the Burleigh Patent Seat Company, of South Lawrence, Mass., for the manufacture of lubricators, steam injectors, bearing cups, and general brass work. The company has twelve men employed, and will increase to fifty men after tools are provided.

We are informed by the Craig Double-Sight Feed Lubricator Company, Lawrence, Mass., that owing to the superior working of the new cylinder lubricator, recently brought out by them, they will hereafter sell the new one to the exclusion of any heretofore made by them, and without change in price or curtailment of inducements to the trade, or to engine builders.

The Chicago Steel Works are equipping a new building, 40x90 feet in size, to be used exclusively for the manufacture of cultivator attachments, such as shovel backs, etc., which is to be made a prominent part of the business of the works. All necessary machinery has been provided, and recent improved methods will, the company states, enable it to put these goods on the market very low.

A pooling arrangement has been made between the principal English, Belgian, and German rail makers. It is agreed that in quoting prices of rails for export, their works shall not compete against each other, but that the orders obtained shall be distributed among the different works according to a certain fixed arrangement, and those who do not obtain orders shall be compensated for their idleness in some way.

The Roanoke (Va.) Machine Works have begun to build locomotives. The *Leader* of that city, in a late issue, says: The first entire locomotive built at machine works here was turned out on last Monday and passed over the track. It was of the mogul pattern, No. 117, and for the Norfolk and Western Railroad. It attracted a good deal of attention and presented a fine appearance. The workmanship was apparently of the best kind, and it moved like a thing of life amid the plaudits of numerous spectators.

A stock company with a paid-up capital of $40,000 has been formed in Columbus, Ga., and named the Columbus Ice and Refrigerating Company; N. P. Banks, president. They have contracted to put in two of H. D. Stratton's improved ammonia absorption ice machines; capacity, ten tons each, daily. They will manufacture ice and ship beef in refrigerator cars, from Kansas City, and keep it in their refrigerators in Columbus for the markets in that and adjoining cities. They expect to be in operation in two months.

The Yale & Towne Manufacturing Company, Stamford, Conn., is now building for the Pottstown Iron Company a ten-ton power traveling crane, 60 feet span; and for W. Scott & Co., manufacturers of printing presses, Plainfield, N. J., a ten ton power traveling crane, 30 feet span. It is also building for the Midvale Steel Company, of Nicetown, Pa., two fifteen-ton power jib cranes, which are to be used in connection with a steam hammer. The strength of these cranes to resist strains is to be thirty tons each. The company is also building for the Chicago, Burlington, and Quincy Railroad a five-ton power walking crane; for Pratt & Letchworth, Buffalo, N. Y., a five-ton steam jib crane complete, with engine; and has also on hand a number of orders for hand-power cranes of various types.

The Boston *Commercial Bulletin* says: The American Watch Company, of Waltham, posted a notice Tuesday afternoon rescinding the notice posted Monday, and stating that, in place of the proposed shutdown two days in a week, the factory would be closed at noon on Friday, July 18, and reopen Tuesday morning, August 19, and that the June wages would be paid July 15, and the July wages August 19. This is giving a month's vacation, instead of two weeks, as originally intended, and withholding the money with which it was generally intended to enjoy that vacation until it is ended, which causes no little disgust among the employes. The dullness of the watch trade, the unusually low prices for watches now prevailing, and the practice of selling on very long time that has recently grown to large proportions, are the alleged causes for the action noted.

Robert E. Masters, Columbus, Ga., writes us, under date of July 6: A new steamboat, which is being built by the Columbus Iron Works Company, was launched here yesterday, July 5. She was pushed to the incline with jack-screws. The ropes were then cut, and she slid down port side to the water without a jar, bow and stern striking the water at the same time. She floated off as gracefully as a swan. She is being built for the central line of boats—a chartered company—and they do not belong to the Central Railroad, as is generally believed in this section. She is named Naiad, and is intended to take the place of the ill-fated steamer Everingham. She is 125 feet long, 22 feet wide, and fitted up with 28 staterooms, and will be the finest boat, when finished, on the Flint, Chatahoochee, and Apalachicola rivers, upon which she will ply.

The *Mining and Industrial Journal*, of Bangor, Me., says: At the annual town meeting, last spring, the citizens of Old Orchard voted to exempt from taxation for ten years any manufactory established in that town. Since that time the citizens have shown in various ways their earnest desire to promote the establishment of manufactures. Necessary land has been donated, and a corporation known as the Citizens' Building Company has been organized with a capital of $10,000. The officers are as follows: President, Simon M. Blake; secretary, Chas. W. Ross; treasurer, John Jameson. Directors—Irving J. Brown, Charles W. Ross, Simon M. Blake, Moses G. Palmer, John Jameson, James C. Jordan, Stephen G. Dorman, William T. Fernald, and Gen A. Harleigh Hill. It is anticipated the first building erected by this company, for manufacturing purposes, will be a shoe factory. The company have been in receipt of proposals from several parties, and the same are being given consideration at present.

Machinists' Supplies and Iron.

NEW YORK, July 10, 1884.

The supply business is about as last reported.

In American iron transactions continue limited, with about an even balance between production and consumption. We quote No. 1 X Foundry, at $20 to $21; No. 2 X $18 to $19; Grey Forge, $16 to $17.

Scotch pig—Shotts, $21 to $21 75, to arrive; Coltness, $22, yard; Glengarnock, $21 50; Gartsherrie, $21.50 to $22; Summerlee, $20 50; Eglinton, $19.50.

Antimony—Hallett's, 10¾c.; Cookson's, 10¾c.

Copper is dull, with small sales of—Lake, 14c. to 14⅛c; other brands, 13c. to 13⅛c.

Lead has sold in small lots at 3.60c., but is not in demand.

Spelter—Refined, 8c. to 8¾c.

Tin sells slow at—Banca, 20¾c.; Straits and Malacca, 18¾c. to 19c.

✲WANTED✲

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Situation by young man as fine lathe hand. Address D K., 178 Varet street, Brooklyn, N.Y.

Wanted—Experienced foreman in specialties of iron and brass. Address "Foreman," 59 Main street, Buffalo, N. Y.

A thoroughly educated mechanical engineer and draughtsman, first-class in electrical engineering, desires engagement. Address Box 4, AM. MACHINIST.

Mech'l engineer and draughtsman desires engagement as designer of special machinery, or to work out inventions. Address "Providence," AM. MACH.

Wanted—Machine shop foreman used to first-class engine work. None except those who can give the best of references need apply. Address M. D. Leggett & Co., Cleveland, O.

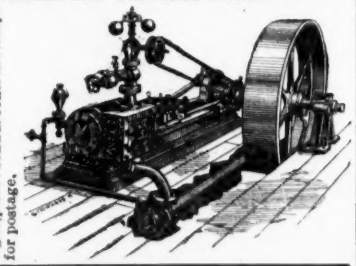
A thoroughly educated mechanical engineer and draughtsman, well posted in steam engineering, desires an engagement enabling him to prove his worth. Highest references from leading American and foreign shops. Has designed original machines for leading firms. Address "Box 15," AM. MACHINIST.

For Sale—Richards-Elliott indicator, in excellent condition, with five springs and scales. Address D. Ashworth, Second and Elm streets, Cincinnati, O.

Wanted—Parties traveling and selling to steam users, or dealing in mill supplies, to take the agency of a good and fast-selling article. Good inducements offered. Address "Manufacturer," care of AM. MACHINIST.

A first-class New York house, manufacturing improved sugar machinery, etc., desire a Chicago connection, for the sale of their goods on commission. With a good, reliable house, willing to push sales, a liberal arrangement would be made. Address S S. & Co, office of AM. MACHINIST, New York.

COOKE & CO., DEALERS IN
MACHINERY & SUPPLIES,
No. 22 Cortlandt Street, New York.
HORIZONTAL ENGINES,
BOILERS AND VERTICAL ENGINES.



In writing for circular, please mention this paper, and state what articles you want circulars of. If you want complete machinery catalogue, please send 20 cents in stamps for postage.

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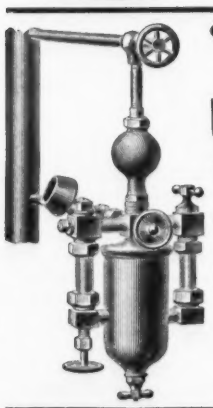

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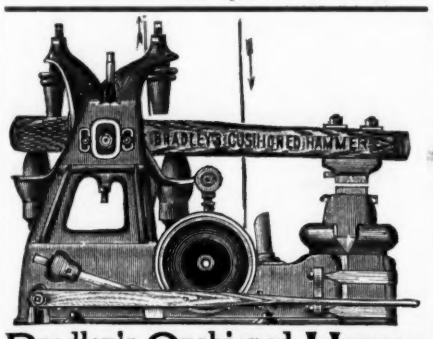

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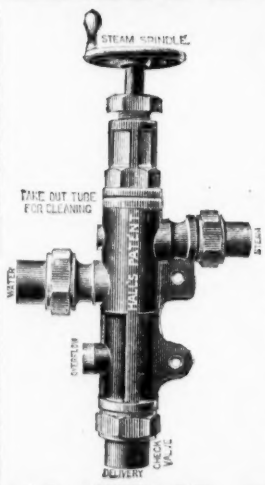

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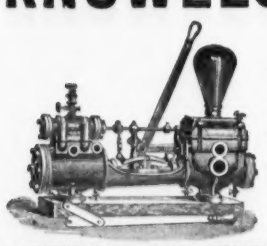

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Air Pumps and Condensers for steam Engines a specialty. Will save from 20 to 30 per cent. fuel.
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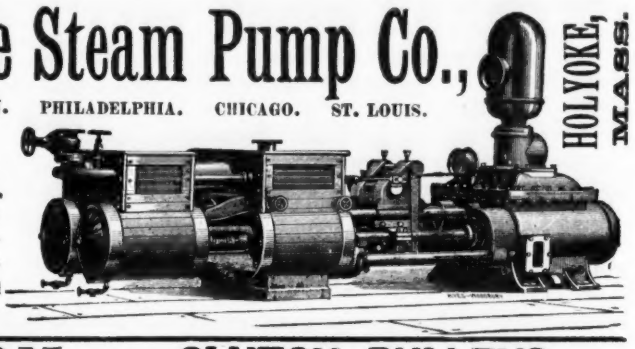

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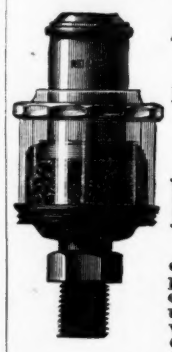

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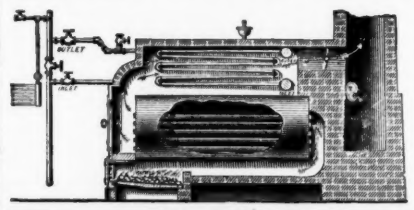

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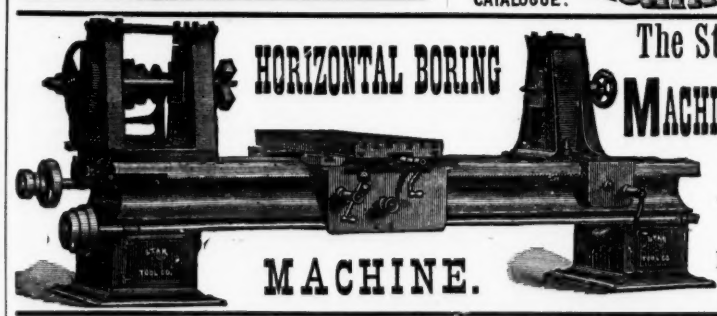

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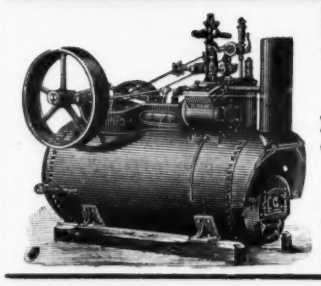

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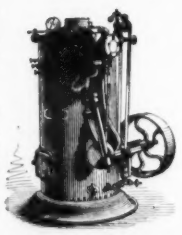

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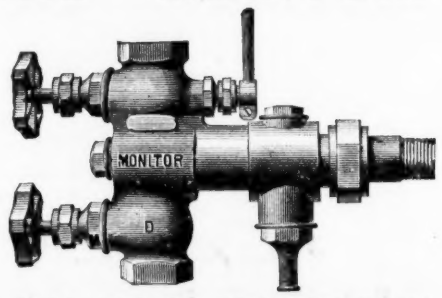

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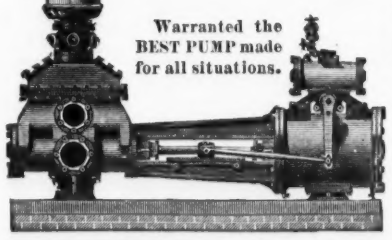

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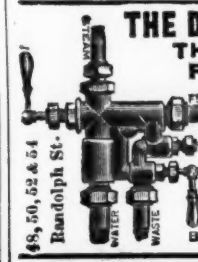

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" 13	2 1-4 "	1.60
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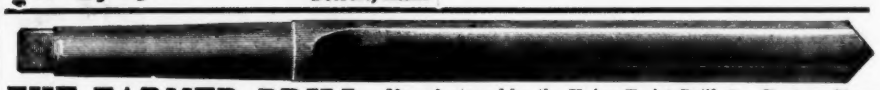

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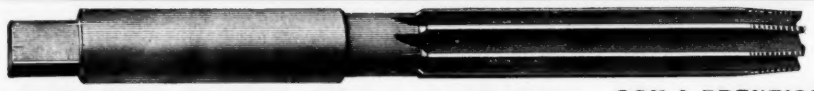

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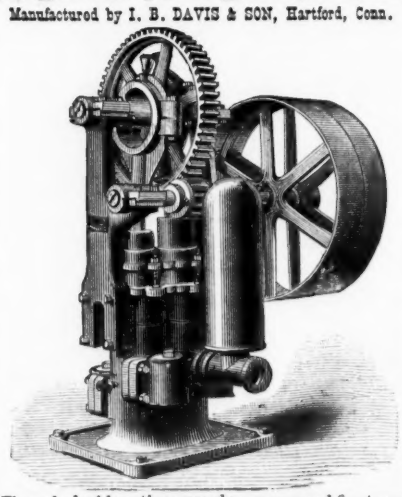

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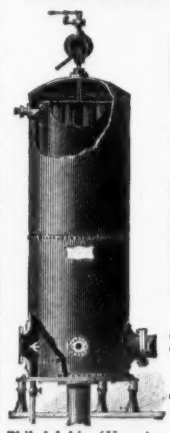

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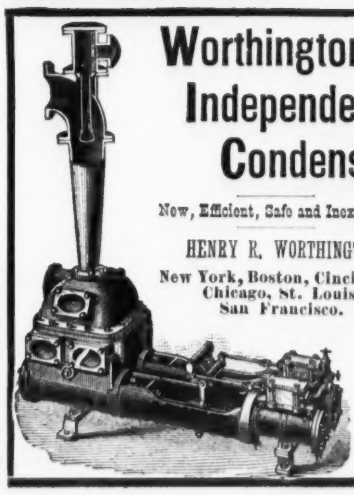

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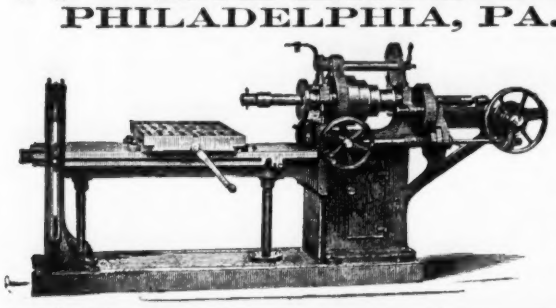

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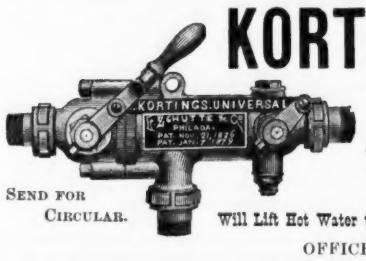

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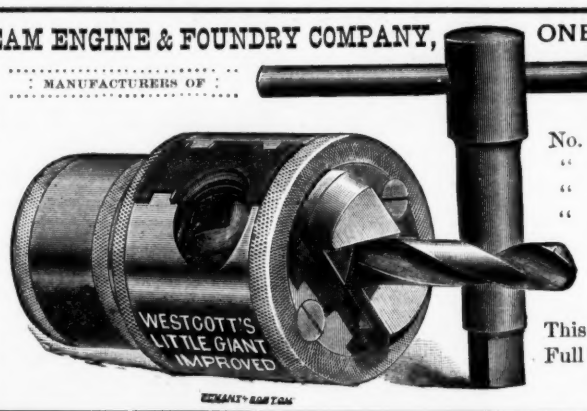

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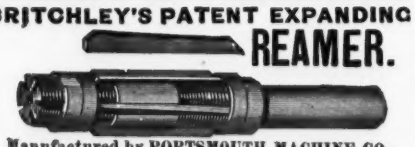

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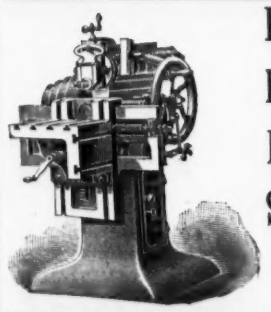

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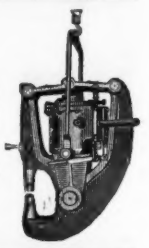

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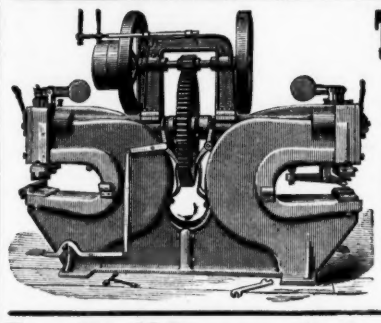

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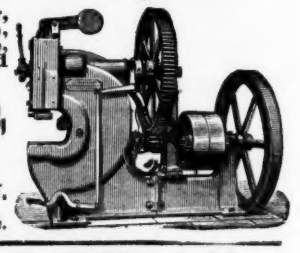

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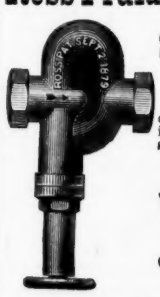

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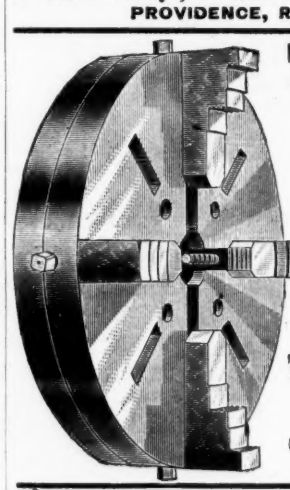

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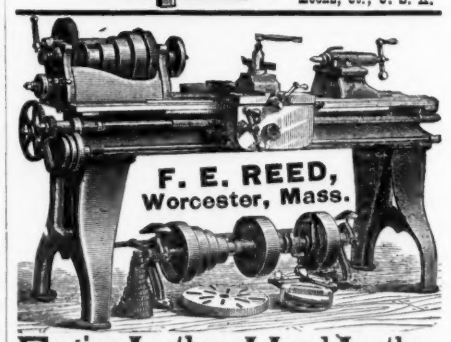

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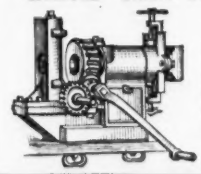

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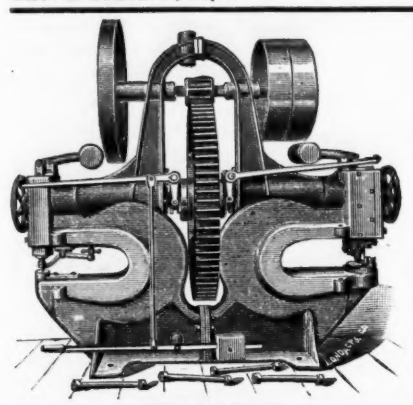

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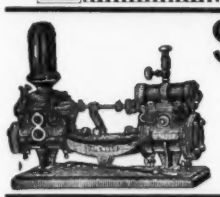

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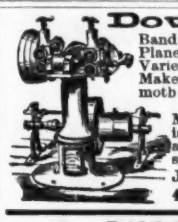

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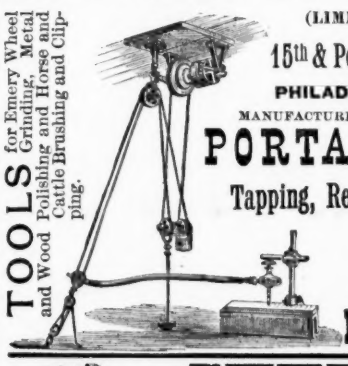

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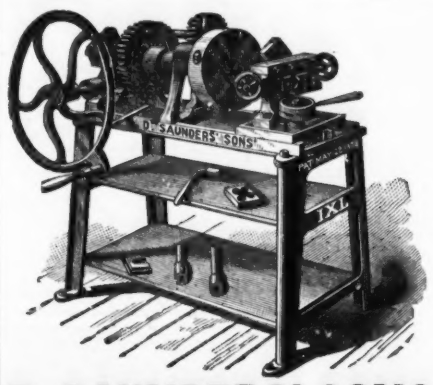

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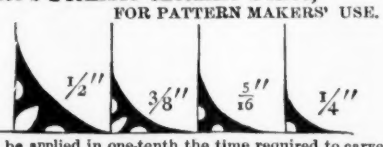

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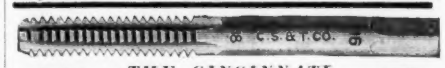

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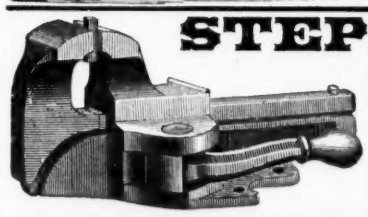

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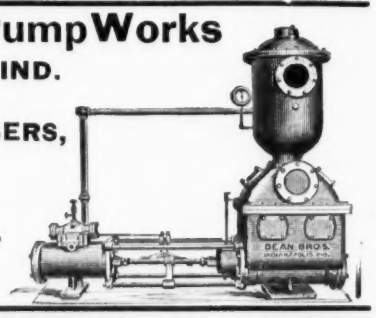

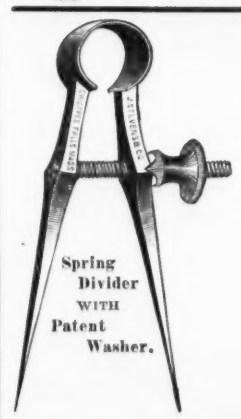

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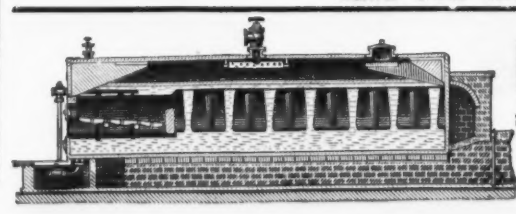

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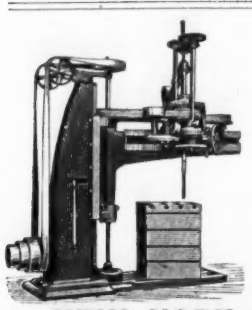

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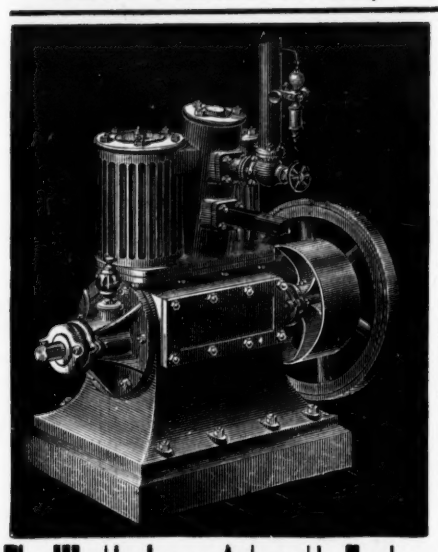

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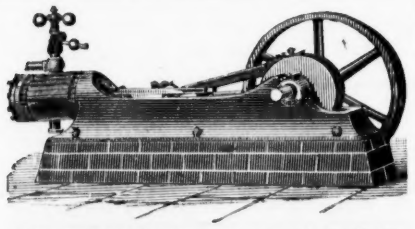

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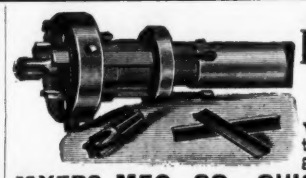

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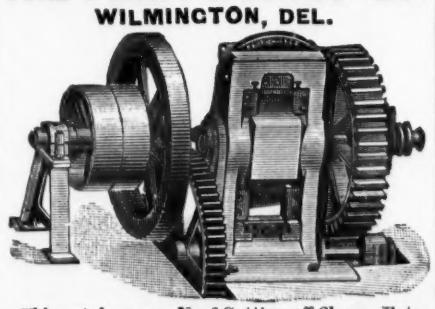

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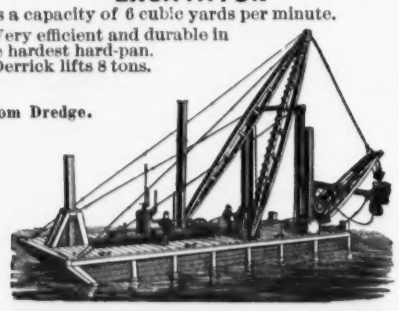

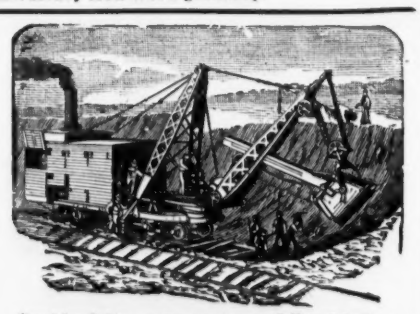

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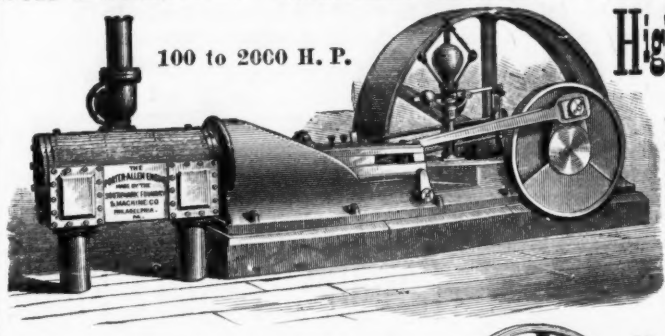

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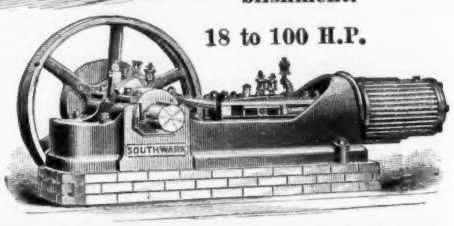

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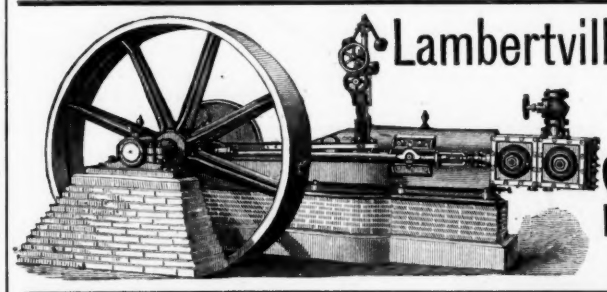

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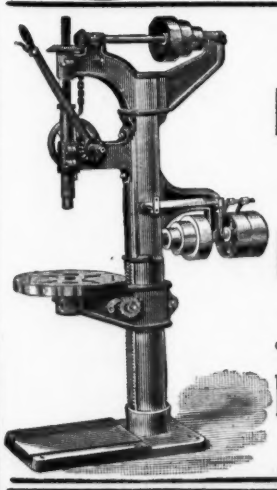

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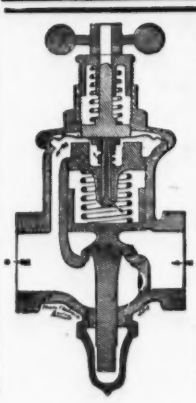

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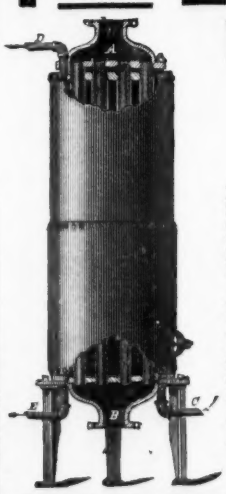

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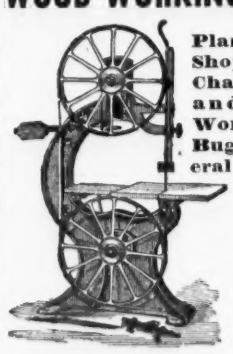

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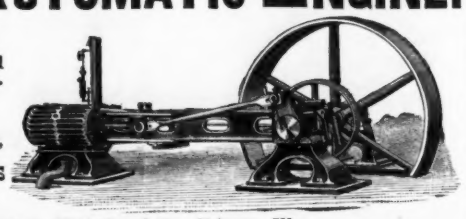

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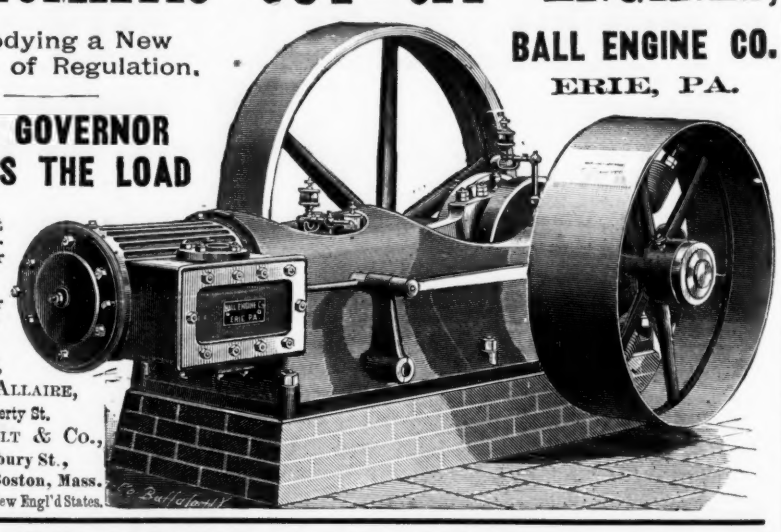

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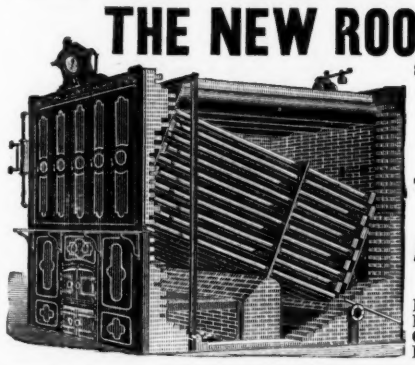

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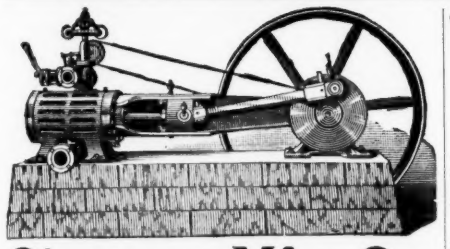

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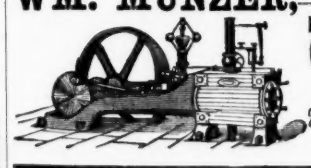

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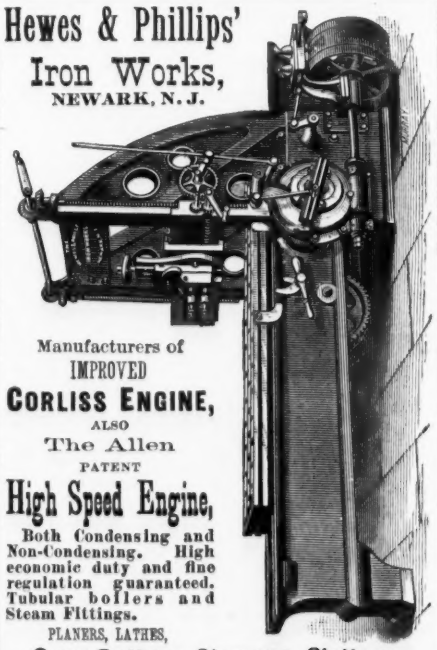

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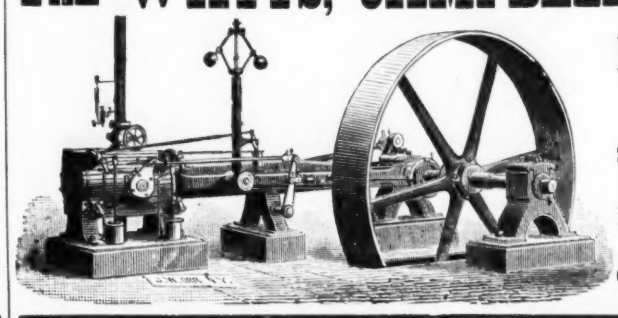

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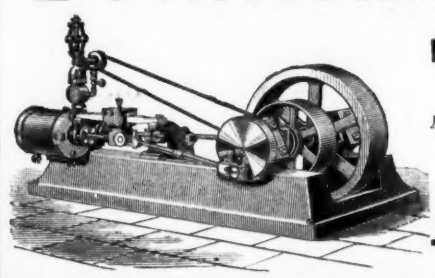

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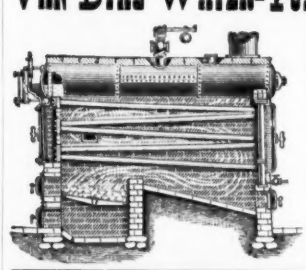

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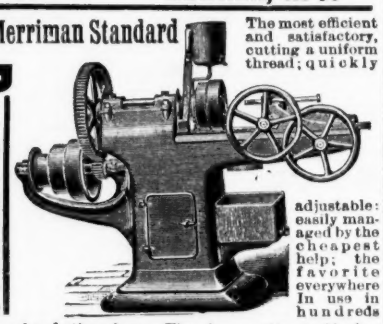

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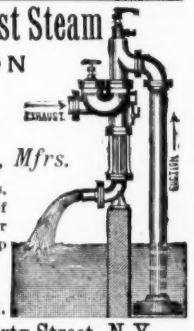

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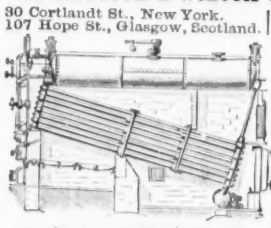

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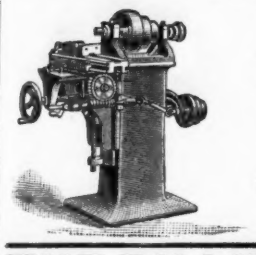

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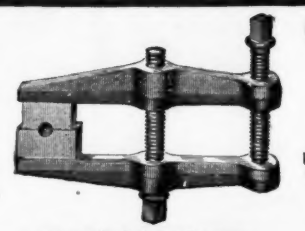

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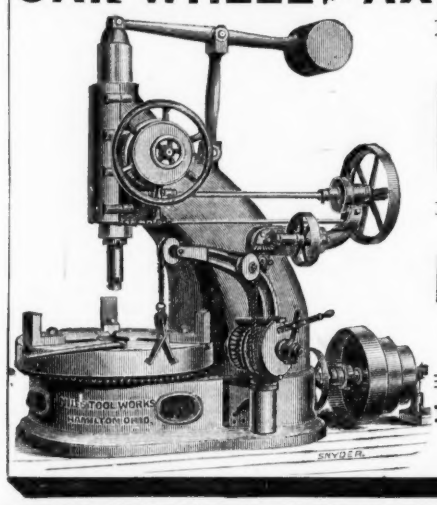

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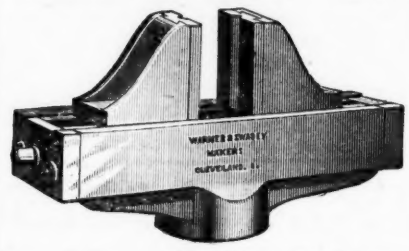

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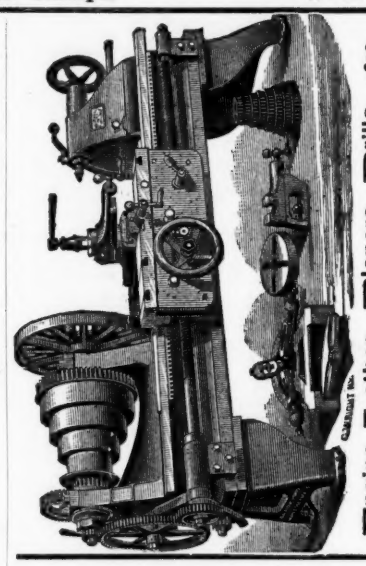

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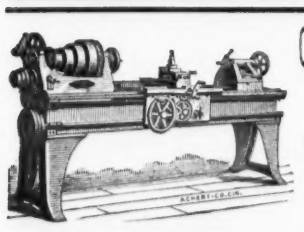

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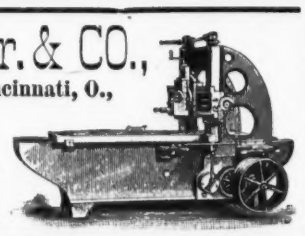

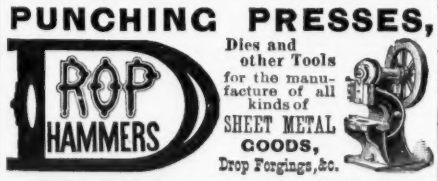

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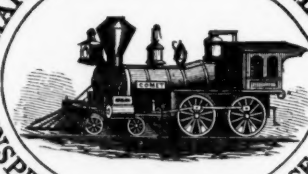

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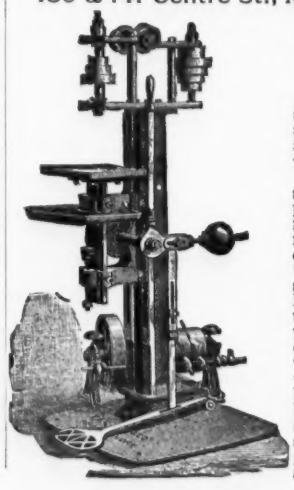

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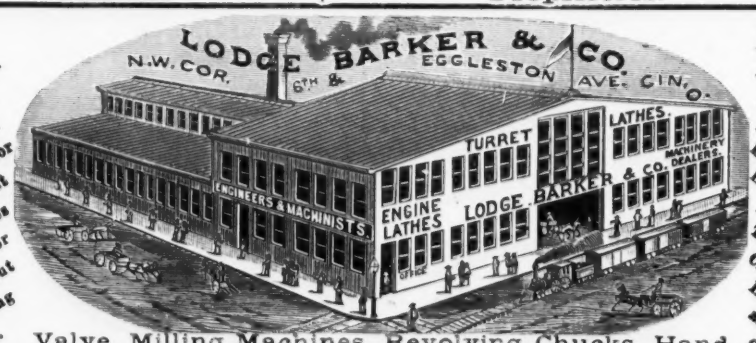

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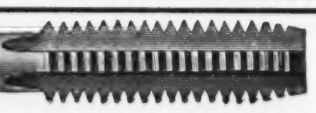

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